The NATIONAL GEOGRAPHIC MAGAZINE

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THE NATIONAL GEOGRAPHIC MAGAZINE

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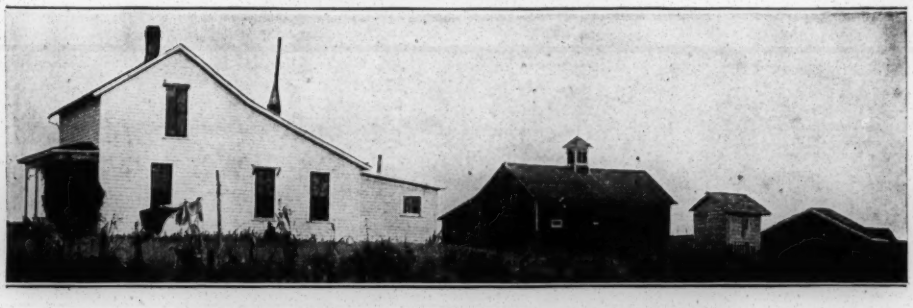

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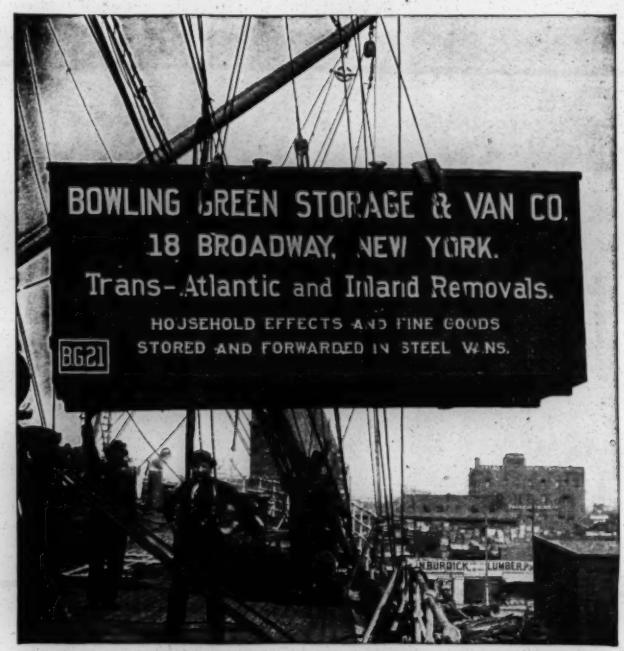
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VOL. XIX, No. 4 WASHINGTON APRIL, 1908

THE NATIONAL GEOGRAPHIC MAGAZINE

ALONG THE OLD INCA HIGHWAY

BY HARRIET CHALMERS ADAMS

With photographs by the author

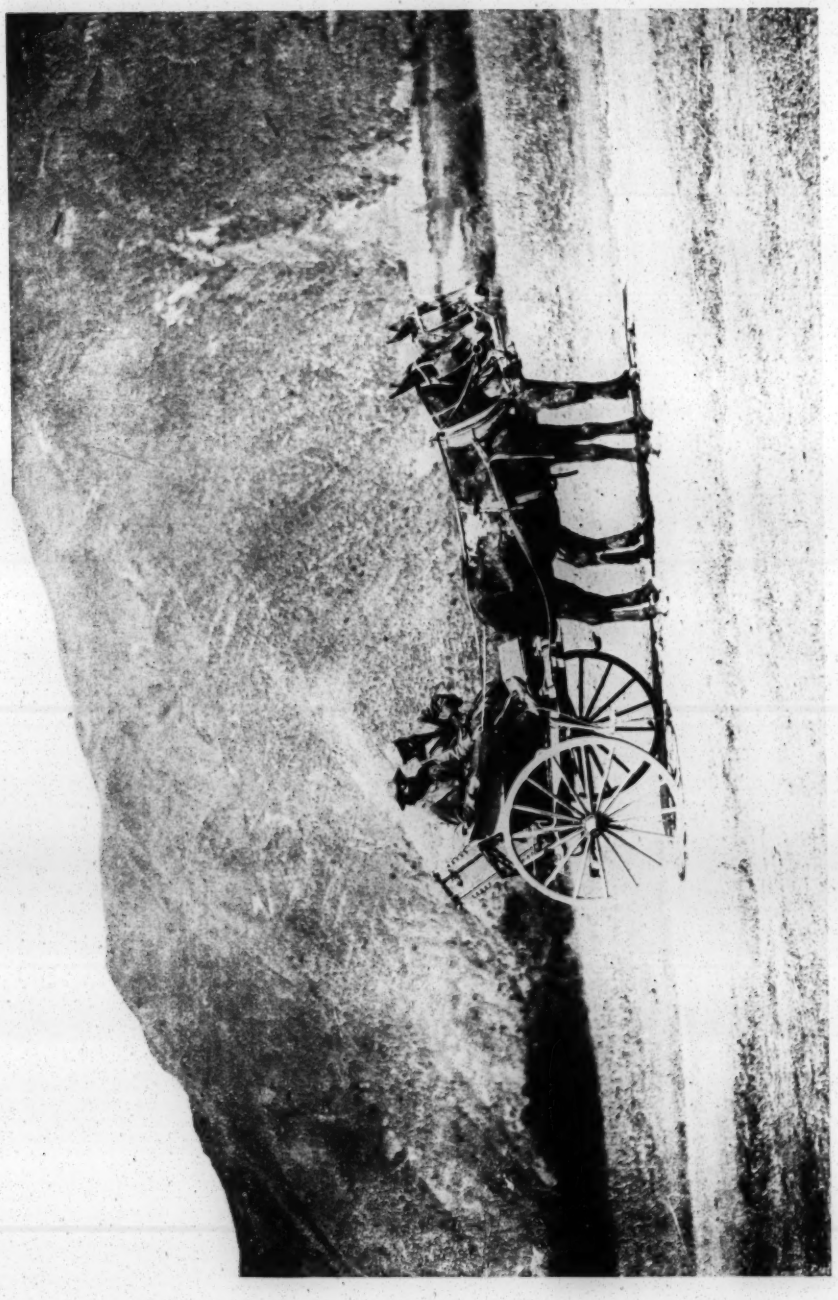
ON a June morning a season or two ago, we started out from Sicuani, then the terminus of the Southern Railway of Peru, for Cuzco, ancient capital of the Incas. We had decided not to engage passage on the regular stage coach which connects Sicuani with Cuzco, but to journey instead by private vehicle, that we might loiter by the wayside to study the *Quichuas,* the remnant of a once mighty people who prospered in this highland country. Remembering the Spanish proverb, "If you can't get what you like, like what you get," I pretended to be quite enthusiastic over our equipage, which consisted of a rickety cart holding the two of us and our *cholo* driver, two slow but well-meaning mules in the lead. The Peruvian *cholo* is of mixed Indian and Spanish blood and considers himself in every way superior to the pure-blooded *Quichua.*

From Sicuani we traveled over the old Inca highway, worn by the feet of many pilgrims, of many llama trains, in the days before the Spanish conquest. The home life in these *bolsones,* the fertile mountain basins which are linked with the valley of Cuzco, is little changed since the long ago. The people are now of Roman Catholic faith and a church tower marks the site of each village, oxen and other domestic animals have been introduced; but the crude huts, the homespun dress, the primitive method of agriculture, belong to centuries long past.

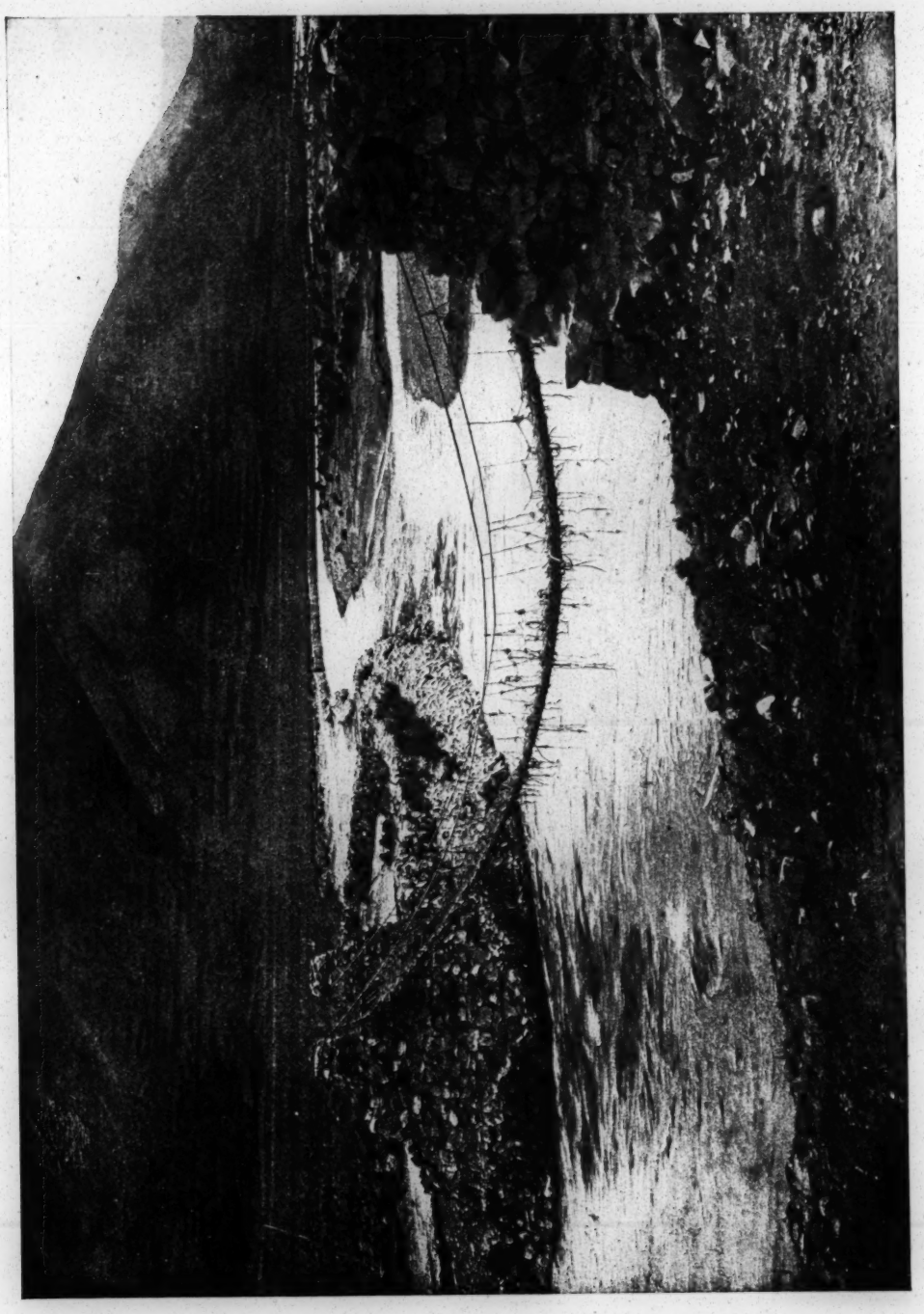
We were so fortunate as to make this journey at harvesting time, and while farming in the World's Roof Garden isn't exactly "up to date," it is most interesting to the traveler. In threshing the grain the men drive the oxen about in a circle, encouraging the poor animals by yanking their tails; in winnowing, the grain and chaff are blown out through a horn, that the wind may separate them. A crooked stick is used in plowing, but what the *Quichua* farmer lacks in modern machinery he makes up in the decorative head-dress of his oxen.

In costume these mountaineers are most picturesque. Throughout the Andean highlands the headcovering changes with the locality, and on the road to Cuzco it consists of a large, flat hat, usually of homespun, dyed bright blue or red, bedecked with tinsel (a modern innovation). Both men and women wear this headgear. The men are attired in knee-breeches, short jackets, and *ponchos;* the women in short skirts and low-cut blouses. They are bare-legged and seem scantily clad at an altitude of 11,000 feet above the sea.

In the villages through which we passed the huts were built of mud and thatch,



OUR EQUIPAGE ON THE ROAD TO CUZCO—MRS. ADAMS AND THE CHOLO DRIVER

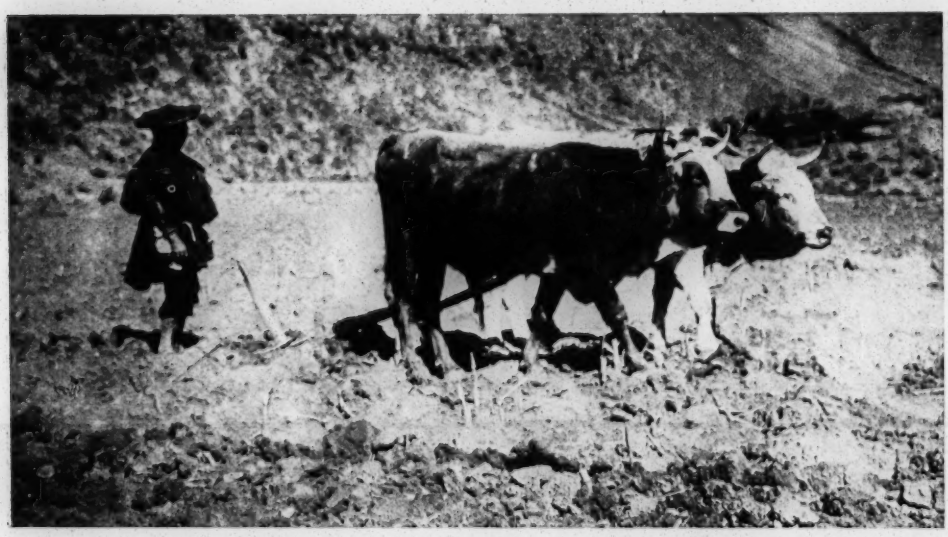


FOOT-BRIDGE OF WOVEN WILLOW OVER RIVER VILCANOTA, ON THE ROAD TO CUZCO

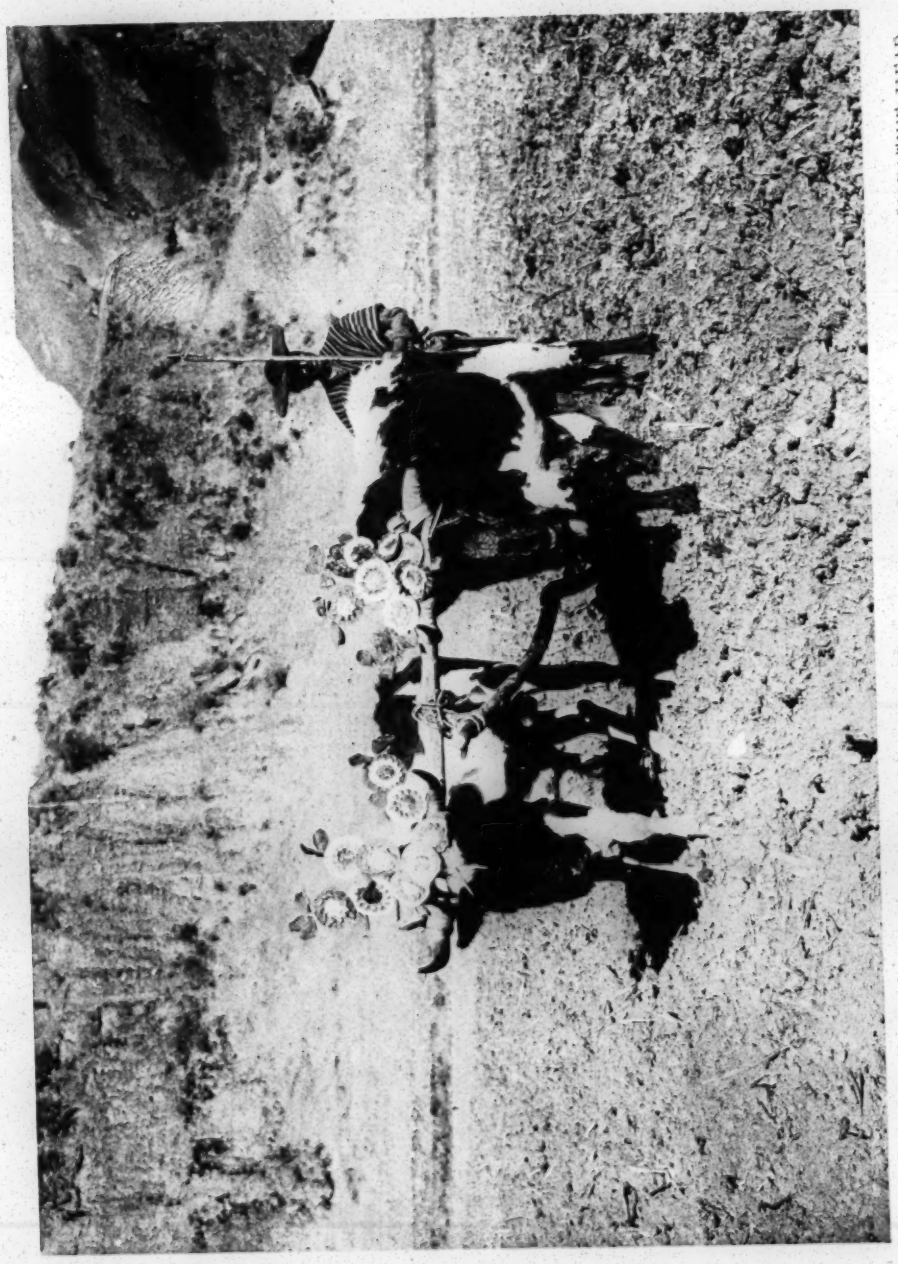
FOOT TRAVELERS

INCA BURIAL TOMB AND ANDEAN HUT OF MUD AND THATCH

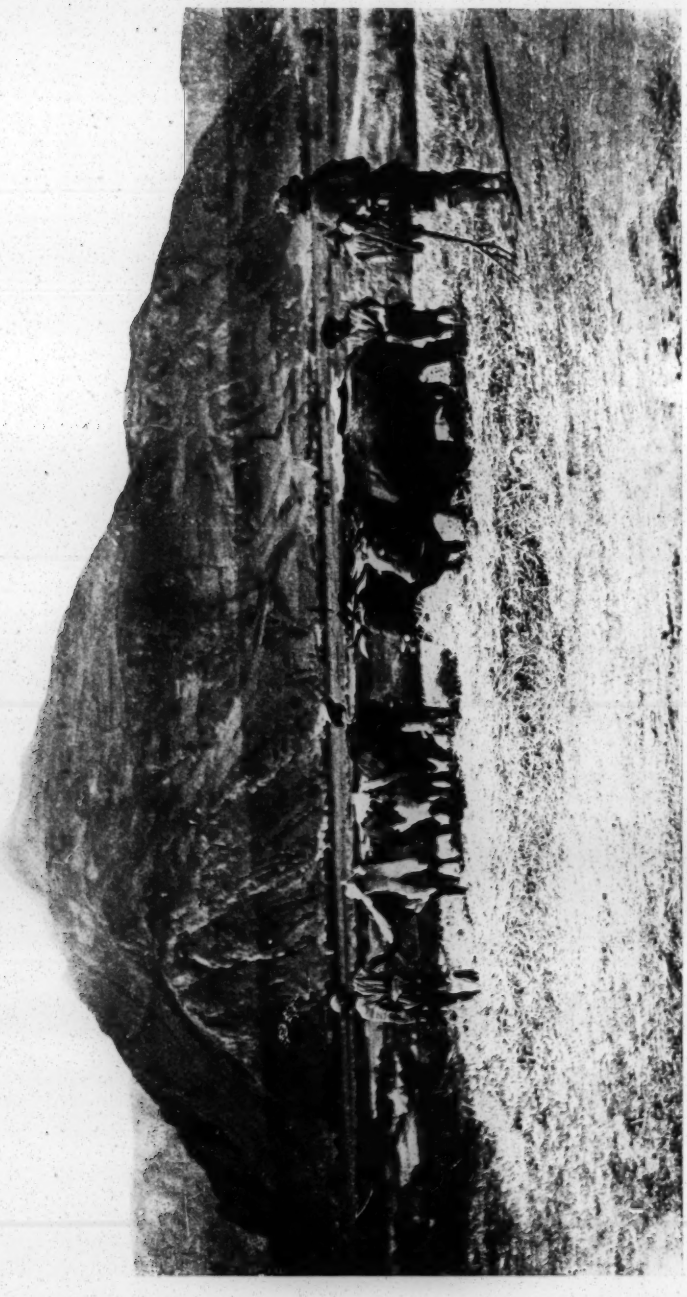
QUICHUA FARMERS



PLOWING AT AN ELEVATION OF 11,000 FEET



WHAT THE QUICHUA FARMER LACKS IN MODERN MACHINERY HE MAKES UP IN THE DECORATIVE HEAD-DRESS OF HIS OXEN



HARVESTING ON THE ROOF OF THE WORLD

GATHERING FUEL FOR THE HOME

and untanned hides covered the doorways; within there were no furnishings save the few crude cooking utensils. The head of the household evidently "slept on the mat with the dog and the cat, the rest of the family close by," no better cared for than his llamas in the nearby corral.

The graceful llamas, little cousins to the camel, are closely associated with my remembrance of the Andean highlanders. Domesticated long ago, they are the best friends of the mountaineers, furnishing wool for clothing, fuel, bearing burdens patiently, calling for little or no care, as they graze by the wayside and require little water. As in the days of Atahulpa, so today a train of laden llamas slowly journeys toward Cuzco; in the rear a *Quichua* boy and girl, both spinning as they walk, using primitive implements, a baby strapped to the young mother's back. The llamas turn their heads quickly to right and left, their curious eyes ever shifting; the young man and woman constantly chew the dried coca leaf, which deadens hunger, cold, and fatigue, and watch for the flag which cheers, which waves triumphant on this ancient highway—the little, white flag which marks a hut where *chicha* is sold.

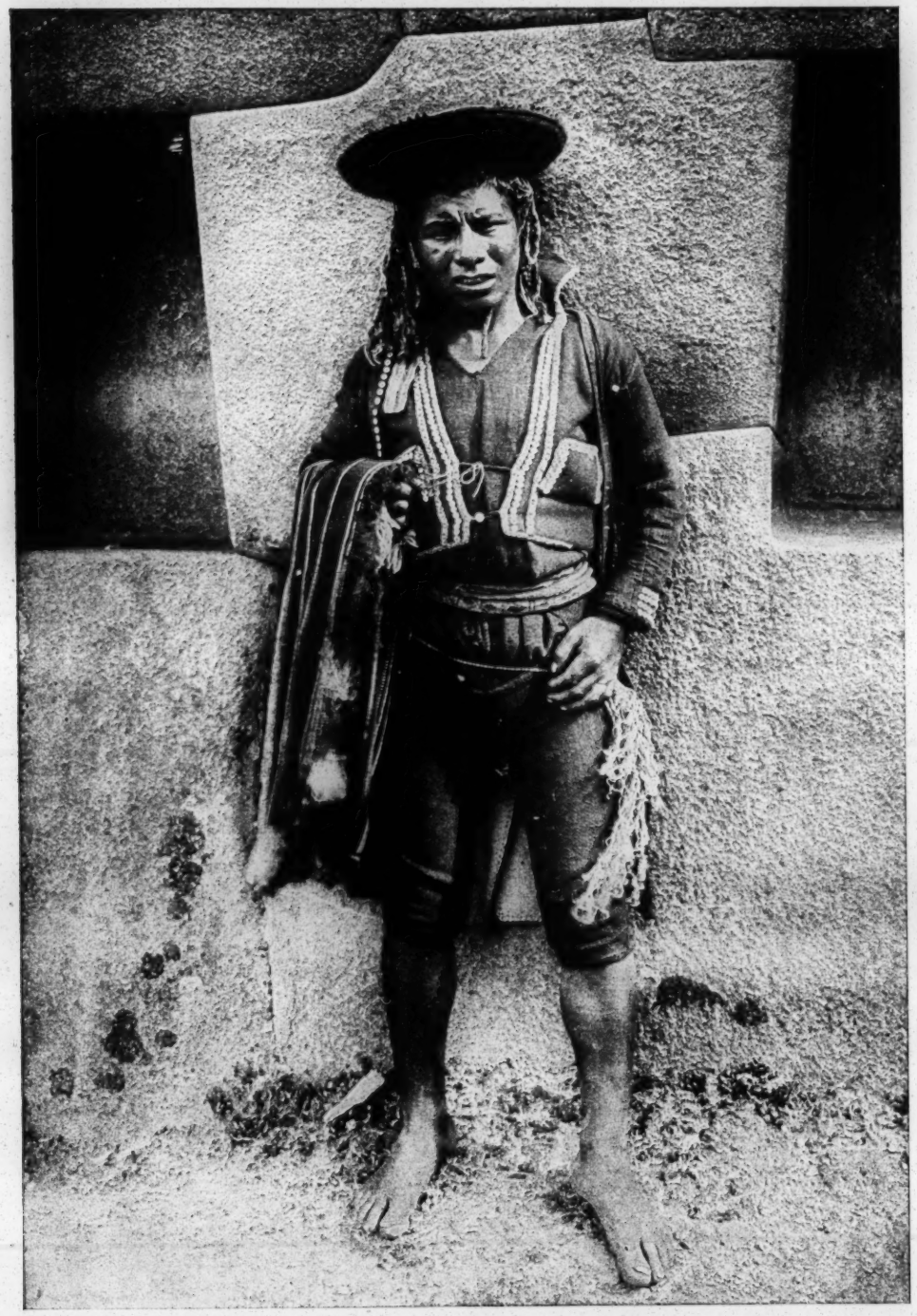
Chicha is the Peruvian drink made from fermented corn. It is highly intoxicating and its victims are legion on *fiesta* days. There are, as I remember, about seventy feast days of the Church celebrated annually in Peru, and the *cholos* and *Quichuas* mark these days less by religious fervor than by an all consuming passion for *chicha*. We decided that *chicha* was an acquired taste; it is as bitter as the Mexican *pulque*. Another Peruvian drink is *aguadiente,* a strong native brandy.

The fare of the highlanders is meager,

REAR GUARD OF A LLAMA TRAIN

BEGGARS

QUICHUA GIRLS RETURNING FROM MASS



A FULL-BLOODED QUICHUA, DESCENDANT OF A PEOPLE WHO LAID THESE GREAT STONES

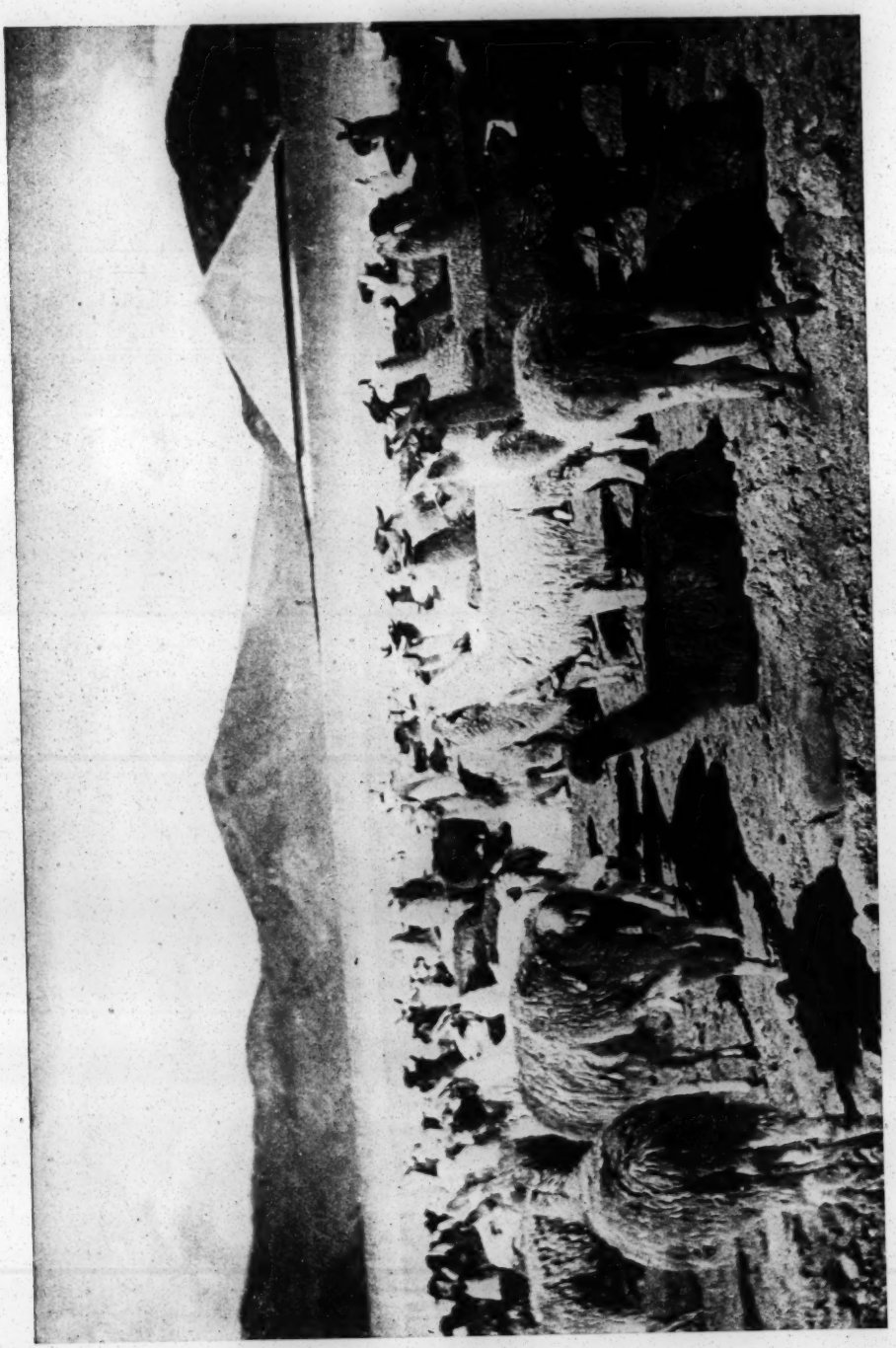
THE PATIENT BEASTS OF BURDEN OF THE ANDEAN HIGHLAND

RESTING AT A WAYSIDE HUT

"AS IN THE DAYS OF ATAHUALPA"

THE DECORATED LEADER OF THE LLAMA TRAIN

"WITH HEADS BOWED AND UNCOVERED THEY STOOD, AS IN THE LONG AGO, GREETING THEIR BELOVED CUZCO, SACRED CITY OF THE SUN"



A HERD OF LLAMAS OFF DUTY. THE PYRAMID IS A MIRAGE, THE RESULT OF A DOUBLE EXPOSURE

FARMING IN THE WORLD'S ROOF GARDEN

consisting of maize, *chuño,* the frozen potato, *cholona,* dried goat or mutton, and *quinua,* a cereal which thrives at high altitudes. We passed many little fields brightened by the reddening *quinua,* its tall stalks waving like corn. The valleys through which we journeyed were narrow, bordered on either side by steep mountain walls. High up on the hillsides were cultivated patches, little farms which seemed in danger of falling over into the swiftly flowing river below. This river is the Vilcanota (we had seen its birth back in the snows at the Pass of La Raya); beyond Cuzco it is called the Yucay; farther on, the Ucayali, and it is the longest formative branch of the Amazon. Our road followed the river's windings and crossed bridges laid by the Colonial Spaniards on old Inca foundations.

Our first view of these massive stones was at the ruins of the Temple of Viracocha, about half a mile from the highway. One great wall alone remains of this once splendid edifice, said to have been erected by the eighth Inca ruler. We saw many lesser ruins of the ancients before reaching Cuzco—forts, evidently, guarding the approach to the capital.

We managed to pick up a few words of the *Quichua* language, which we had need of later on trips beyond Cuzco, where little or no Spanish is spoken. On this main highway Spanish is now the universal tongue, although the *Quichuas* cling to their own expressive language, and their sullen demeanor shows their hatred for the white man and the half-breed. They speak Spanish when they must, but most ungraciously.

My pleasantest recollection of this drive of two days is of the early evening, when we heard the shepherds playing on their pipes. From the hillsides where the flocks grazed came the clear notes, monotonous but sweet, and the music carried me back to Peru's olden days. As we drove through these Andean valleys, past villages and *haciendas,* each church tower, each touch of a more modern civilization, reminded me of one of the saddest histories ever told, of the downfall and slavery of a once contented and prosperous people, now broken in spirit, degenerated; yet in their hearts there remains a love for their lost idols, a reverence for their old religion. When we at last reached the heights overlooking Cuzco

RUINS OF THE TEMPLE OF VIROCOCHA, ABOUT HALF A MILE FROM THE HIGHWAY

the sunset glow was gilding its many towers, and near us on a worn spot on the highway stood a group of poorly clothed *Quichuas,* with sad, unenlightened faces, forgetting their cruel Spanish masters, forgetting their Church and their Cross. With heads bowed and uncovered, they stood as in the long ago, greeting their beloved capital—Cuzco, Sacred City of the Sun.

HOME-MAKING BY THE GOVERNMENT*

An Account of the Eleven Immense Irrigating Projects to be Opened in 1908

BY C. J. BLANCHARD

STATISTICIAN, U. S. RECLAMATION SERVICE

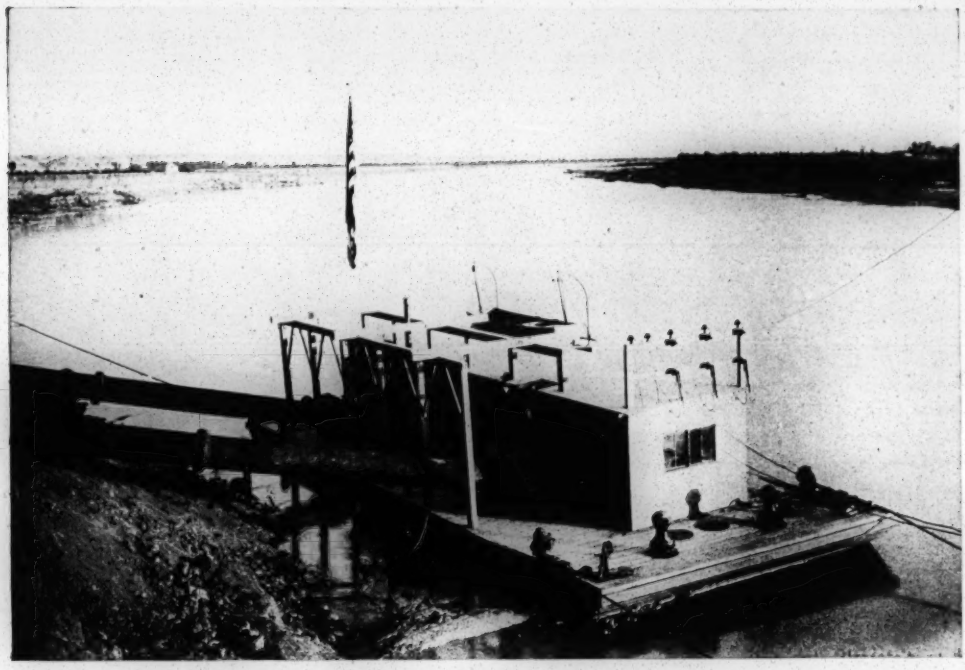
WE have come upon a time in our national life when the question of providing homes for our people bulks larger than ever before. The time is not far distant when it will become acute. The rapid narrowing of the limits of our unoccupied public domain and the tremendous increase in land values in all the settled sections of the United States render it yearly more difficult for the man of small means to get a foothold on the land. There is congestion today in many of our cities, and the menace of a great population underfed and poorly housed looms more darkly each year. So great is the land hunger that already a quarter of a million families, comprising some of the best blood of the nation, have expatriated themselves and taken up new homes under a foreign flag. What is the use of preaching love of home and country when we offer nothing but crowded tenements to the toiler who seeks to earn a roof over his family?

Our nation's greatness has its foundations in the home of the man whose feet are firmly planted upon his own land. There is no national stability in a citizenship born and reared in tenements. Patriotism, loyalty, and civic pride are not bred and fostered in the crowded centers of population. The destiny of the nation is foreshadowed in the provisions made for the prosperity and contentment of its citizens. An assurance that the great mass of our people shall reside in homes of their own is an insurance that our future will be one of stability and progress.

The home-making instinct is a well-developed trait in American character. Our forefathers who landed on the bleak and inhospitable shores of New England, their descendants, the pioneers who conquered the middle West, and the Argonauts of this generation who crossed the trackless plains were impelled by this instinct more than by the love of adventure or the lure of gold to wander forth into strange lands.

From the very inception of our Republic our legislators have recognized that it was a national duty to render the acquirement of homes as easy as possible. This recognition was shown in liberal grants to the defenders of the country in Revolutionary times, and later in the beneficent homestead law which opened to settlement the Mississippi Valley. It has been recognized since by the enactment of other statutes making easy the acquirement of public domain. Areas greater in extent than many of the original states have been donated for the purpose of making habitable the unutilized lands of the people. At one time the

* An address to the National Geographic Society, March 13, 1908.



PUMPING BARGE OF THE U. S. RECLAMATION SERVICE: WILLISTON PROJECT, NORTH DAKOTA (SEE PAGE 252)

property of the nation embraced 1,800,000,000 acres; today it has been reduced to less than 500,000,000 acres. Much of it was squandered by the government, it is true, but out of that public domain twenty vigorous commonwealths have arisen, and an agricultural empire has come into being that is today the marvel of the world.

The remaining public lands occupy two distinct agricultural regions, differing materially in climate, soil, and crops. West of the Missouri River lies a vast region extending westward to the foothills of the Rocky Mountains and from the Panhandle of Texas northward into Canada. It is known as the Great Plains. For many years the vast region has been utilized as a public common. Countless cattle and sheep have had free access to it and have overgrazed it. Its administration is still one of the most vexing problems before Congress. The pioneer of the Great Plains was the cattleman. He farmed but little, and from the nature of his business and the methods of operation, as a rule, wanted no neighbors.

The real home-builder, who undertook to subdue the plains to agriculture, encountered many difficulties. In many sections there was no timber and he was forced to build his house of sod or adobe. He found the streams were not dependable; they were dry in summer, when water was most needed. Nature, however, provided an inexhaustible supply of underground water, which the farmer pumped into small reservoirs and then led to his garden and orchard and supplied his live stock. He harnessed the wind, which blows almost constantly on the prairies, and made it a cheap and useful servant for his work.

Within the past 15 years there has been an awakening to the opportunity which lies in the Plains area, and settlements have moved westward with such remarkable rapidity that the day of the broad,

free range, with the old, careless, and often inhuman methods of stock-raising, is about over. The day of smaller flocks and herds, winter fed and fattened on home-grown forage, is at hand.

PROJECTS IN NORTH DAKOTA

In the Great Plains area the Reclamation Service has in process of construction 11 projects involving an expenditure of $18,740,000 and the reclamation of 500,000 acres. Several of these projects are unique, and in their engineering features are deserving of extended description. All have reached a stage of construction where water will be available this season, and the hundreds of new homes which dot the prairies show that the settlers are preparing to put it to use.

Three of these projects are located in North Dakota, in the valley of the Missouri River, and in the vicinity of the town of Williston. The Missouri River at this point is a whimsical stream, habitually cutting its banks and changing its channel, so that the engineers find it impracticable to locate any permanent structure for the diversion of water by gravity.

Fortunately great beds of lignite were discovered in the vicinity on public land, and the engineers proposed that the government should turn coal miner, mining its own coal and developing power therefrom. A large power-house was erected at the mine and power is now conveyed electrically to the river. An exceedingly unique plan was devised to overcome the eccentricities of the Missouri. The pumps are placed on floating barges, which will accommodate themselves to changes in the river channel and in the water level. The water is delivered through pipes with flexible joints into reservoirs, and from these basins is pumped into the canals. These reservoirs serve to settle the silt, large quantities of which are carried in solution by the Missouri River. The central plant, near Williston, supplies power to two of these projects.

A heavy influx of settlers is anticipated this spring to take up the lands to be irrigated. Diversified and intensive farming by irrigation will bring about a great change in the agricultural methods now in vogue in this section. The cultivation of alfalfa, sugar-beets, vegetables, and such fruits as apples, cherries, grapes, melons, and berries of all kinds, for which this region is adapted, will doubtless create a prosperous community here in a few years. This project is on the Great Northern Railway.

LOWER YELLOWSTONE PROJECT

Not far from here, in the Lower Yellowstone Valley, and embracing 66,000 acres of land in Montana and North Dakota, is the Lower Yellowstone project. The settlement of this large area has been progressing rapidly, and aside from a few thousand acres of railroad lands, which will be sold this spring, about all the land is filed upon. The works include a timber-covered, rock-filled dam 700 feet long, headworks of concrete, and a huge canal 67 miles long and several hundred miles of laterals and small ditches.

HUNTLEY PROJECT, MONTANA

Up the Yellowstone about 200 miles is the Huntley project, which was completed last June. It is located 12 miles east of Billings, Montana, and embraces 30,000 acres of land, having a general elevation of 3,000 feet above sea level. The irrigable area has been divided into 589 farms of 40 acres each, and about half of these have already been filed upon. The project offers unusual advantages for the practical farmer of small means to secure a good home, whereon by his own industry he can secure a comfortable living. The climate here is delightful and the soil of exceptional fertility, producing bountiful crops when watered. Cereals and alfalfa are the principal crops, although apples, small fruits, and garden vegetables do well. On account of the fine range country surrounding the project, alfalfa will always be a staple product. It produces about five tons to the acre at present and is worth $5 a ton in the stack. A sugar-beet factory is now in operation at Billings and the farmers are increasing

their acreage in this crop, as it is very profitable. Unusual facilities for transporting crops to the large markets are afforded by two lines of transcontinental railroads, the Northern Pacific and the Chicago, Burlington and Quincy, which traverse this tract. No farm is more than three miles from a shipping point. There are eight new towns on this project at intervals of about 5 miles along the two lines of railroad, and town lots are now offered for sale by the government at reasonable prices.

SUN RIVER PROJECT, MONTANA

Not far from the thriving city of Great Falls, Montana, the first unit of the Sun River project will be opened to settlers on May 7. This project, when completed, will be one of the largest undertaken by the government, irrigating nearly 256,000 acres, or considerably more than the cultivated acreage of Rhode Island. An interesting feature in connection with this project is the proposition of the engineers to augment the water supply by taking water from the streams now flowing into the Pacific Ocean through a gap in the continental divide to a watershed which drains into the Atlantic Ocean. The Sun River Valley proper is about 70 miles long and from 1 to 5 miles wide. The unit to be opened in May is the abandoned Fort Shaw Military Reservation, which contains about 200 80-acre farms.

On this project the rural settlement plan of the Reclamation Service will be carried out, and there will be a village about every six miles. The soil is a warm, sandy loam covered with buffalo grass, gramma, and wheat grass. All the crops which can be grown in the northern countries can be raised in this section. The principal crops will be largely alfalfa, sugar-beets, and potatoes.

MILK RIVER PROJECT, MONTANA

In northern Montana the Milk River project, by reason of the international character of the streams to be diverted, has attracted a great deal of attention. The irrigable area in the valley of Milk River is greater than the water supply, and the engineers propose to store water now flowing into Hudson Bay to augment the insufficient flow of Milk River, a tributary of the Missouri. Nearly 250,000 acres are involved in this project. The valley has a soil of sandy loam well adapted to raising all the products of the north temperate zone. The construction of the necessary dams and canals will require several years. Milk River Valley is tributary to the Great Northern Railroad.

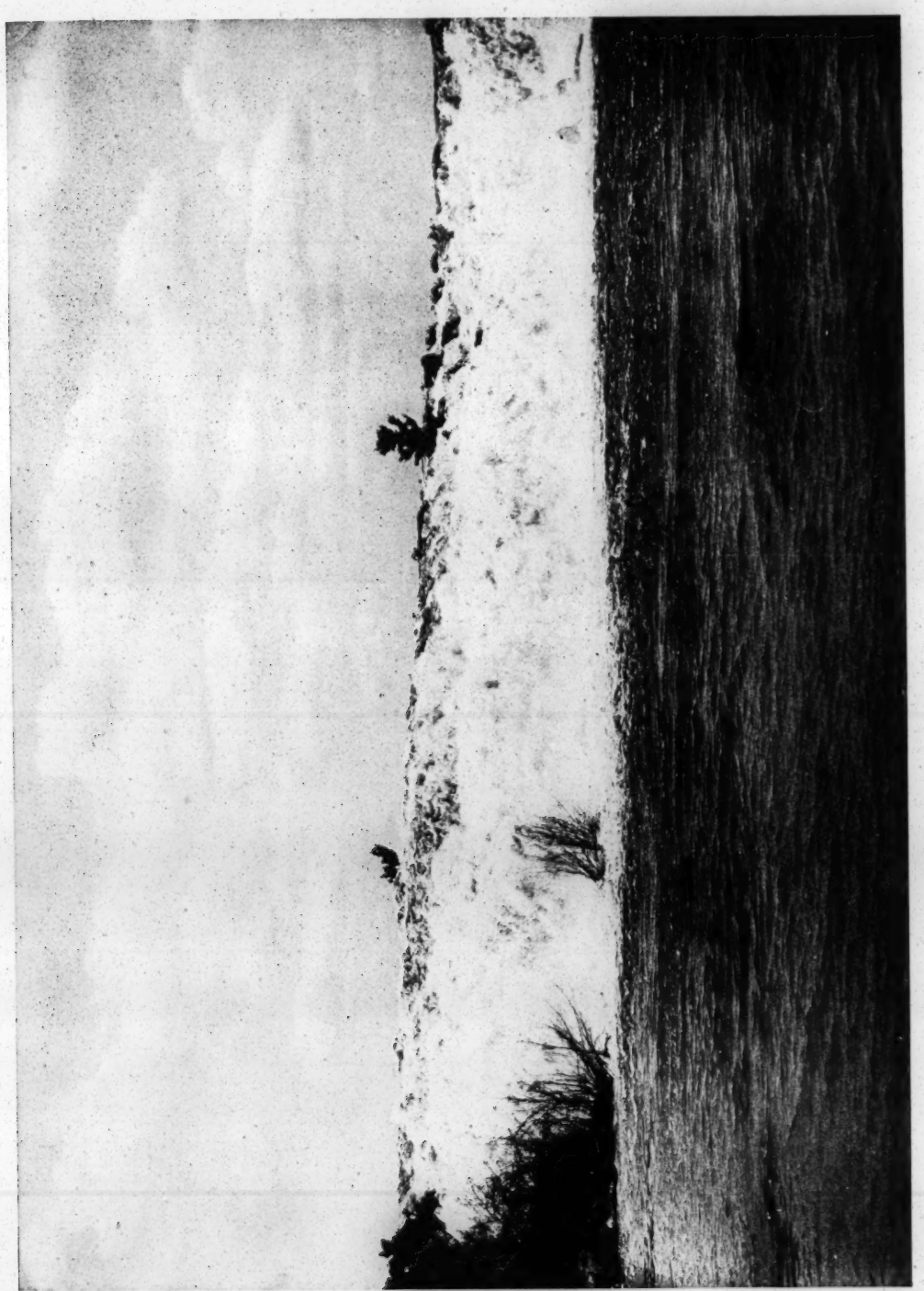
SHOSHONE PROJECT, WYOMING

On the northern border of Wyoming, in a region of exceedingly rough country, the government is building the highest masonry dam in the world. This structure, which will rise 310 feet above its foundation, blocks a very narrow gorge. It will be 108 feet thick on the bottom and only 175 feet long on top. We might get a better conception of the enormous height of this dam if we compared it with the height of some familiar building. Take, for instance, the Flatiron building, in New York. Placed side by side, the Shoshone dam would rise one story higher.

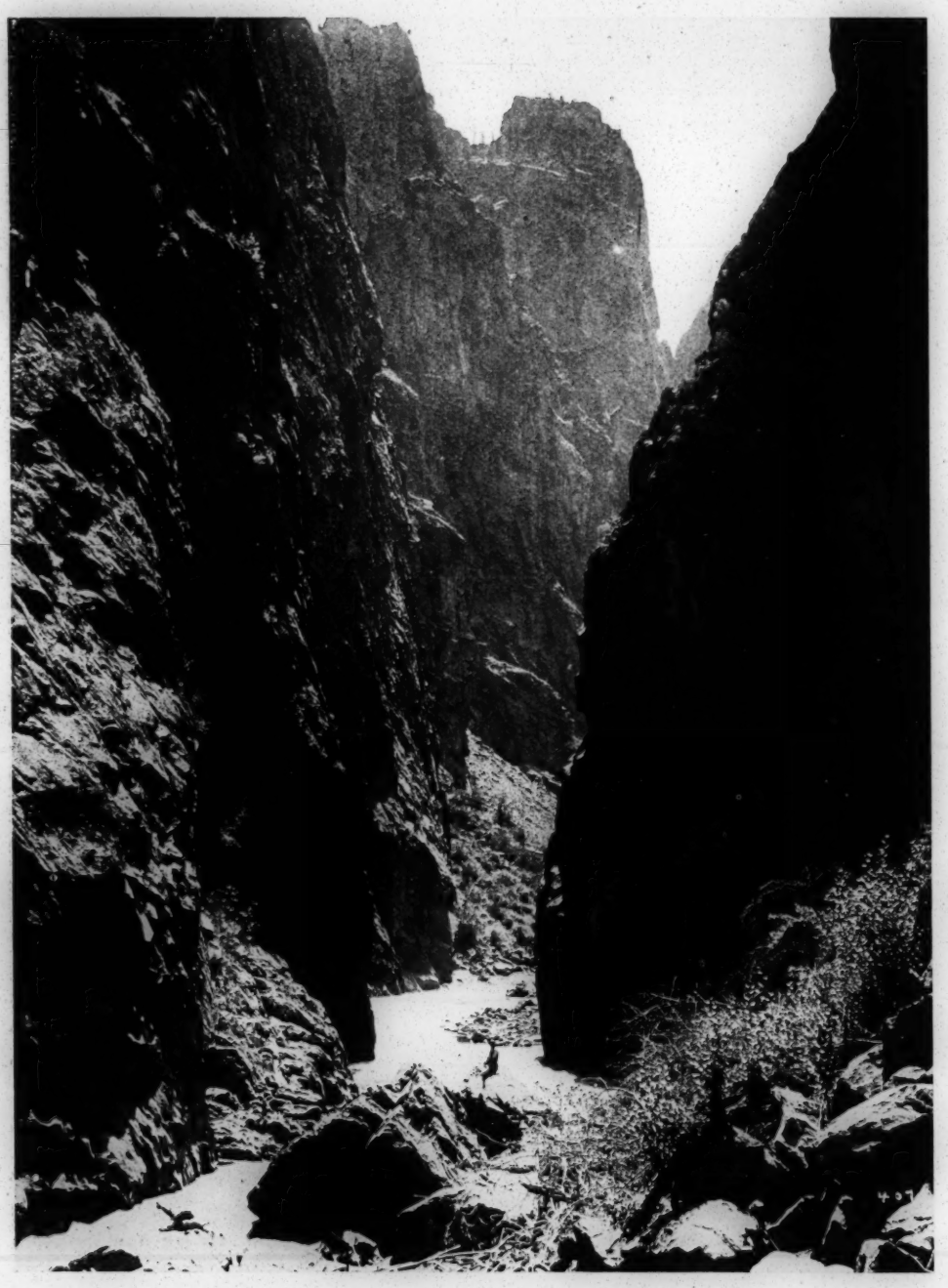
The work here is difficult and dangerous. Workmen are lowered into the canyon, the walls of which are hundreds of feet high, and, with ropes about their bodies as they work, put in the drill holes for blasting. Before work could be begun on this structure it was necessary for the Reclamation Service to build a road 8 miles in length to get into the canyon. This road was cut for the most of the distance from the solid walls of rock. The dam will create behind it the largest lake in the State of Wyoming, with a superficial area of 10 square miles and an average depth of 70 feet.

Twelve miles below the Shoshone dam a diversion dam is being built in the river which will turn the stream into a tunnel 3¼ miles in length, connected at the other end by a large canal which carries the water out upon 100,000 acres of choice land. A portion of this area will be watered next spring, and is opened to settlement at this time to *bona fide* citi-

CATTLE KNEE DEEP IN ALFALFA: GARDEN CITY PROJECT, KANSAS (SEE PAGE 257)



BLANCHARD FALLS: MINIDOKA PROJECT, IDAHO (SEE PAGE 263)



IN GUNNISON CANYON: UNCOMPAHGRE PROJECT, COLORADO (SEE PAGE 263)

zens of the United States. The irrigable lands are reached by the Chicago, Burlington and Quincy Railway.

NORTH PLATTE PROJECT

In southern Wyoming another large work is well under way. The structure known as the Pathfinder dam is being erected in a narrow canyon of the North Platte River at the identical point where General John C. Fremont, the noted explorer, nearly lost his life while attempting to get through in a boat. This structure will be 215 feet high and will create an enormous reservoir with a storage capacity of 1,025,000 acre-feet, or enough water to cover 1,025,000 acres a foot deep. To better appreciate the quantity of water in this reservoir it should be understood that it is sufficiently capacious to hold back the greatest flood ever known in this turbulent stream. In connection with this dam and reservoir the government has built a large canal 95 miles in length to carry the waters onto lands in Wyoming and Nebraska. Owing to the rough country along the canal route, several large concrete viaducts were constructed and for several miles the canal is lined with cement. The irrigable lands are tributary to the Chicago and Northwestern, Chicago, Burlington and Quincy, and the Union Pacific Railway systems.

BELLE FOURCHE PROJECT, SOUTH DAKOTA

Northeast of the Black Hills, in South Dakota, lies the beautiful valley of the Belle Fourche, embracing several hundred thousand acres of exceedingly fertile land. In this valley the Reclamation Service has nearly completed a great work for the irrigation of 100,000 acres.

By means of a concrete diversion dam the entire flow of the Belle Fourche River will be diverted into an inlet canal 6½ miles in length and large enough to carry the minimum flow of the Potomac River at Point of Rocks. This canal turns the water into a natural depression between two hills. This depression is blocked by one of the largest earthen embankments in the world, a structure more than a mile in length and 115 feet in maximum height. The reservoir thus formed has a storage capacity of 203,770 acre-feet, and forms the largest lake in the State of South Dakota.

Home-seekers have been pouring into this valley for the last two years, and nearly all of the public land is now occupied by settlers who are awaiting the completion of the works. The towns in the valleys have more than doubled in population since the work began. There are opportunities for home-seekers to secure land from private owners whose holdings are in excess of the requirements of the Reclamation Act. The principal markets for the products of this valley are the mining towns in the Black Hills, the Twin Cities, also Omaha and Chicago, which are reached by the Chicago and Northwestern and Chicago, Burlington and Quincy railways. Back of the irrigated country is a vast area of public lands which is available for ranging cattle and sheep. The principal products will be alfalfa, cereals, vegetables, and the hardy fruits.

GARDEN CITY PROJECT, KANSAS

In southwestern Kansas the Garden City Project, although embracing only 8,000 acres, is relatively one of the important government works in the Plains region. Owing to the numerous novel features involved in its construction, the project has attracted much attention. It is believed that the successful initiation of this system will encourage private capital to take up work in other parts of the Arkansas Valley and elsewhere on the Great Plains.

As the Arkansas River could not be depended upon to supply water to gravity canals, the engineers devised a scheme to utilize the underflow. About 300 wells were sunk, the combined length of which exceeds 4 miles. These wells are in groups of 12 each and vary from 12 to 15 inches in diameter. Each group will be operated by its own pumping plant, and all pumps will be operated by electricity generated in a central power station. The water from the wells will be

lifted into a concrete-lined conduit, which discharges into the main canal. During the irrigation season this leviathan pumping plant will lift 30,000 acre-feet, or about 11,000,000,000 gallons.

The value of land in this part of Kansas, in its natural condition, varies from $5 to $15 per acre. When reclaimed by irrigation it is easily worth from $100 to $150 per acre. The principal crops are sugar-beets and alfalfa, considerable quantities of which are already under cultivation. Apples and melons are especially profitable crops when irrigated. This section is tributary to the Santa Fé system.

NEW MEXICO PROJECTS

There are three national projects in the Territory of New Mexico, two of which, the Carlsbad and Hondo, are practically completed and will water 30,000 acres this season.

The Hondo Project provides for diversion and storage of the flood waters from Hondo River, a tributary of the Pecos, and will reclaim 10,000 acres of land in the vicinity of Roswell. No public land is watered by this project, but lands in private ownership are for sale at reasonable prices.

The Carlsbad Project is located on the Pecos River, in southeastern New Mexico, on the Santa Fé system. The entire acreage is in private ownership, but several thousand acres are included in excess holdings and must be disposed of to farmers who will purchase water-rights under the government system. The price of land varies from $20 to $60 per acre.

The climate is mild. In winter the temperature during the day is seldom below freezing. The summer temperature seldom goes above 100 degrees and the nights are always pleasant.

The soil is a light, sandy alluvium and very fertile. The chief crops in the valley are peaches, pears, apples, cherries, small fruits, alfalfa, cotton, sweet potatoes, celery, and garden truck. Five crops of alfalfa are grown each year, yielding a total of 5 to 8 tons per acre. Fruits, cotton, and alfalfa are the most profitable crops, and fodder-corn, cane, and milo-maize yield good forage crops. Stock-raising is profitable, owing to extensive range lands to the east and west.

There is a good market for horses and mules at Carlsbad, and hay is always in demand here and at other points in the valley. Cotton, after being ginned, is shipped to Houston or Galveston. Kansas City, Wichita, El Paso, Fort Worth, etc., afford markets for all other excess supplies. The Pecos Valley is a good winter feeding center for range stock.

Cotton gins, cotton-seed oil and oil-cake factories, and canneries with adjunct machinery for the manufacure of denatured alcohol are needed in the valley. There are at present water-power plants at Carlsbad and at a point five miles below, and there is room for additional plants further down stream.

The Rio Grande Project involves the construction of a storage dam 255 feet high, opposite Eagle, New Mexico, across the Rio Grande, which will form a reservoir 175 feet deep at its lower end and 40 miles long, with a storage capacity of 2,000,000 acre-feet, for the irrigation of 180,000 acres of land in New Mexico, Texas, and Mexico.

The Leasburg Diversion, which is a part of the Rio Grande project, consists of a low, 600-foot concrete diversion dam, with pier, embankment, and sluice-gates, head-wier and head-gates. In connection with the diversion dam 6 miles of full-sized canal were constructed to connect with the old Las Cruces Canal. Construction was begun November 27, 1906, and water will be supplied to 10,000 acres this summer. The valley has splendid railroad facilities and contains many thriving cities and towns, of which El Paso, Texas, is the metropolis.

OUR INLAND EMPIRE

Beyond the Rocky Mountains lies the true desert, a land of mysterious silence: a land of potential greatness, awaiting the magic kiss of canal-borne water to wake to teeming fecundity. It is often called the inland empire.

XUM

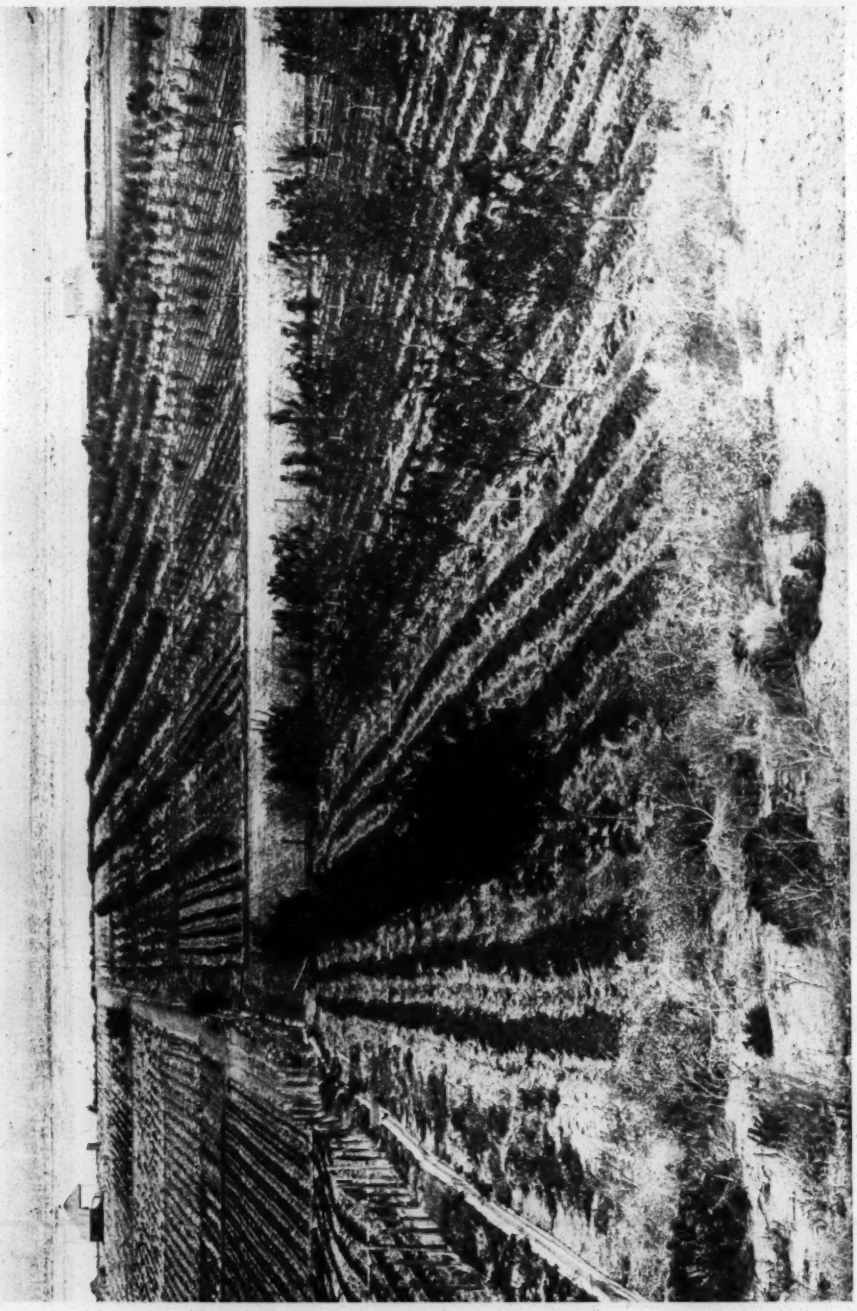
RAISING HOGS IN THE KLAMATH VALLEY: KLAMATH PROJECT, OREGON (SEE PAGE 267)

In many parts of it Nature has placed in juxtaposition all the natural elements except rainfall required for a fruitful, prosperous country. Its climate is healthful and salubrious; its valleys and plains possess a soil of inexhaustible fertility, and from the forest-clad mountains, with summits in regions of perpetual snow, countless streams rush downward to both oceans or flow into desert sinks and there evaporate. How to overcome the absence of moisture from the clouds and thus bring the region to its proper state of development is today a problem of paramount importance. Its successful solution will provide a safety valve against the impending dangers of congestion in the cities of the East.

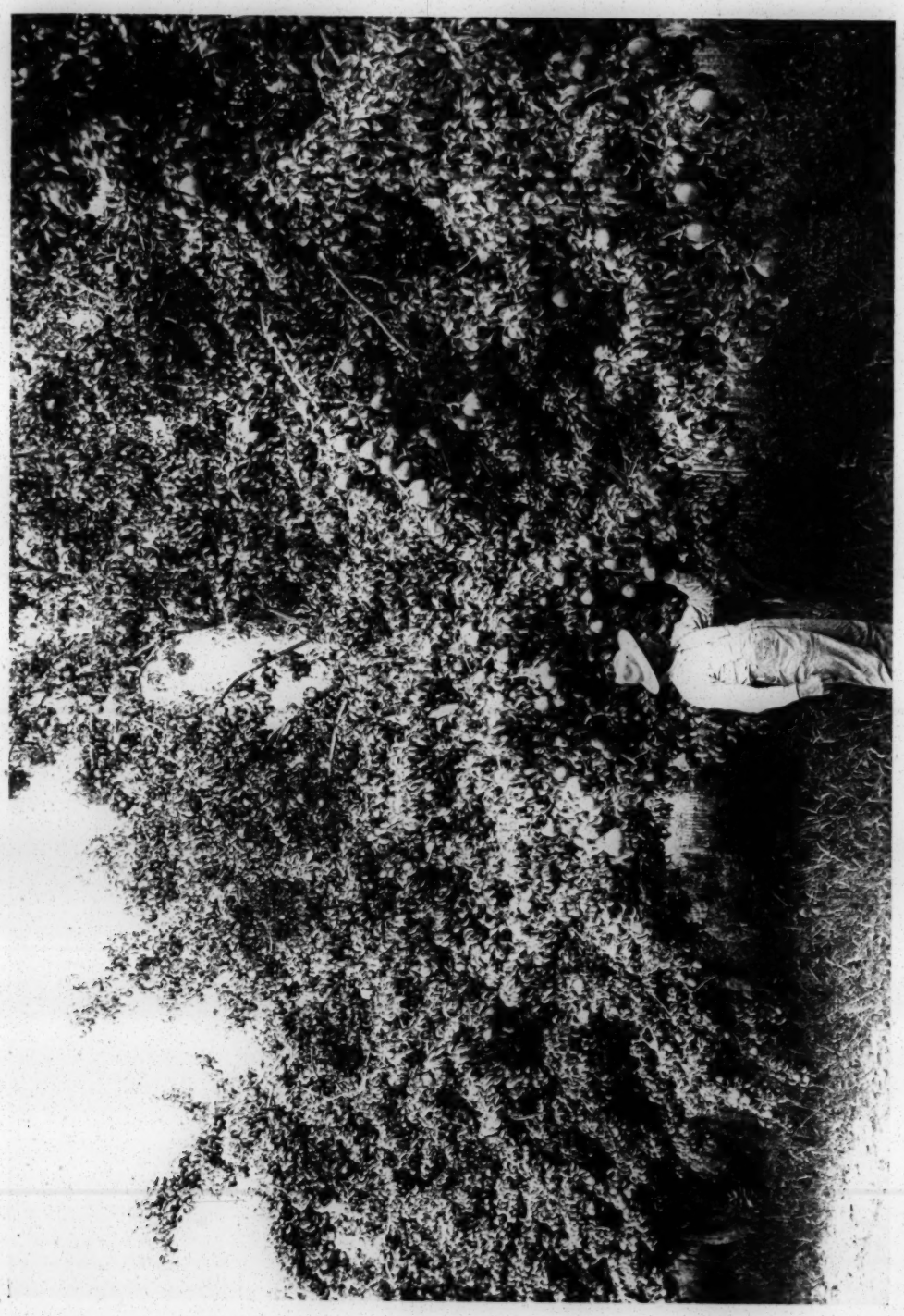
The future of our desert empire is, in a measure, predicated by the marvelous achievements of the pioneers. With a courage born of conviction and fostered by the hope which dwells perennial in the breast of the Argonaut of the sagebrush country, they have, within the past few years, wrested from a region long regarded as absolutely worthless a crop-producing, home-supporting area of inexhaustible fertility, greater in extent than the cultivated lands in Massachusetts, Connecticut, Delaware, New Hampshire, New Jersey, Rhode Island, and Vermont, and capable of supporting a larger rural population. More than $120,000,000 have been expended in irrigation works in the West, and 70,000 miles of canals now carry the life-giving waters to 10,000,000 acres, which each year produce crops valued at more than $250,000,000.

As good American citizens, we owe it to ourselves to extend our knowledge of this splendid country. There is an inspiration in the breadth and vastness of this sleeping empire in the West, and a sublimity in the lofty mountains whose summits are clothed in perpetual snow. One breathes optimism and grows in mental breadth and strength in contemplating scenery which has no counterpart in the world.

The economic value of national irri-



VIEW SHOWING CULTIVATED LAND IN THE LOWER VALLEY OF THE YAKIMA RIVER, WASHINGTON



PEAR TREE IN ORCHARD OF J. H. FORMAN AND PICTURE OF OWNER; NEAR PARKER, WASHINGTON, UNDER SUNNYSIDE CANAL

YAKIMA MAIDEN PICKING HOPS: YAKIMA PROJECT, WASHINGTON

gation cannot be measured in dollars and cents. The desert made habitable offers the boon of health to him who erects his dwelling upon it. You cannot fix the possibilities of this land of silence and sunshine. We know that the influence of its far-flung horizons and its true perspective are potential in character-molding and building. Instead of the dead level of mediocrity, which prevails in modern city life, the desert offers the uplift of unmeasured distances, the perpetual sunshine, and the individual home, with the broader freedom of action which comes with life in the open. There is a constant inspiration to industry, a stimulation to endeavor, in the superabundant life which springs from the bosom of the desert when water is applied. The transformation which follows irrigation is so remarkable that we are prone to believe Aladdin and his lamp have really appeared.

MINIDOKA PROJECT, IDAHO

Three years ago last July I camped for the night on the banks of the Snake River, in southern Idaho. Save for our campfire there was no sign of human habitation within 30 miles, only a vast sage-brush plain, rimmed on every side by the horizon. It was a night to remember. Over us spread a star-gemmed canopy; around us the embers of a sage-brush fire shed their glow. In the near distance the doleful wailing of the skulking coyote sent a chilly feeling up and down the spine.

A weather-tanned engineer in faded khaki sitting beside me drew rough plans in the sand, and I listened, interested, but doubting, while he pictured the future of this dusty plain. That engineer's plans found favor in Washington, and in two months actual work of construction began. An army of men came upon the field and straightway took that river and blocked it with a wonderful dam; then they led it into 130 miles of great canals and 190 miles of ditches, and spread it over 85,000 acres of land.

Attracted by the signs of industry, settlers poured in and every 40 or 80 acres of that vast area was taken up. Houses began to dot the plain and a railroad 100 miles long, a branch of the Oregon Short Line, was built through the center of the tract. Three new towns sprang up as if by magic. On the site of our camp a school-house stands which opened last year with 74 pupils. Today 1,400 families are living on farms and a thousand people are living in towns where a trifle over three years ago the eye met nothing but dust and desolation.

The Minidoka Project furnishes indubitable evidence that a better investment was never made by a government since the world began than national irrigation. President Roosevelt said, "No part of this nation can be benefited without a reflex benefit to the other part." In this one project we find the proof of this statement, for the 1,400 families who are at work in that desert valley in Idaho today are furnishing a market for endless quantities of manufactured articles, the bulk of which are Eastern made.

PAYETTE-BOISE PROJECT, IDAHO

The Payette-Boise Project will reclaim 372,000 acres of land in the fertile valleys of the Payette, Boise, and Snake rivers, in southwestern Idaho, which are tributary to the Oregon Short Line, the Boise, Nampa and Owyhee, and the Idaho Northern railroads. The lands are in Ada, Canyon, and Owyhee counties, and are generally smooth, with gentle slopes. Construction work is well under way and many settlers have already taken up their homesteads.

The valleys are the best populated in the state. The citizens came largely from the middle West and are prosperous and progressive. With superior market and transportation facilities, with soil and climate adapted to diversified and intensive farming, this section is destined to become one of the most densely populated agricultural regions in the Northwest.

UNCOMPAHGRE PROJECT, COLORADO

In southwestern Colorado the most spectacular project of the government is nearing completion. In this region two

streams, the Uncompahgre and the Gunnison, flow in nearly parallel courses about 10 miles apart and separated by a mountain range 2,000 feet high. The Uncompahgre flows through a broad valley containing several hundred thousand acres of fertile land. Its volume is sufficient for the irrigation of only a small part of the irrigable area. On the other hand, the Gunnison River, a stream of much larger discharge, flows in a profound canyon and in its valley there is no considerable area of land to be watered. To augment the insufficient flow of the first stream the greatest underground waterway in the world is being constructed—a tunnel 6 miles long, with a cross-section 10½ by 12 feet, under a mountain 2,000 feet. It will bring into the valley a part of the waters of the Gunnison River. The history of this project is replete with danger, daring, and heroism, and the men who initiated this work and those who have carried it forward furnish proof enough that all of Uncle Sam's heroes do not wear uniforms.

The topographers who followed to complete the original survey encountered almost unheard of trials. Many times it was necessary to lower them by ropes hundreds of feet into the canyon. The location for the tunnel was determined at a point where the canyon was more than a half mile deep. It was necessary then to construct a road into this frightful gorge, a remarkable road, 16 miles long, with grades out of the canyon 23 per cent in places. Heavy machinery was brought in and a power plant installed.

The difficulties encountered have tried the heart of those engaged upon the work. Gas, cave-ins, and subterranean springs have all interposed obstacles requiring the utmost care in the prosecution of the work. At frequent intervals heavy flows of water have been encountered. This has required the installation of complete pumping facilities. At the present time pumps are discharging about 250,000 gallons per 24-hour day, and the quantity pumped has been as high as 750,000 gallons during the same period. More than four miles of the tunnel have been excavated to date. While the tunnel work was going on many miles of canals were dug, some of which were in exceedingly unfavorable country and necessitated cement lining.

Irrigation from this project will begin in 1909, and 140,000 acres of land, much of which is adapted to the growing of deciduous fruits, will be ready for settlement. The Denver and Rio Grande Railway traverses this section.

STRAWBERRY VALLEY PROJECT, UTAH

This project provides for the irrigation of about 60,000 acres of land in central Utah, situated from 5 to 15 miles south of Provo, and on the eastern shore of Utah Lake. Water supply will be received from a storage reservoir to be built on Strawberry River, about 30 miles east of the irrigable area. By means of a tunnel 3½ miles long stored waters will be carried under the divide and emptied into Spanish Fork, from which a canal from 18 to 20 miles long will convey them to the irrigable area. The lands have a mean elevation of 4,500 feet.

YAKIMA VALLEY PROJECTS, WASHINGTON

On the eastern side of the Cascades, in Washington, are a succession of valleys in the drainage of the Yakima River. Comprehensive plans have been worked out by the Reclamation Service and construction is well under way for the reclamation of the largest project yet undertaken. The irrigable area is nearly a half million acres and the cost will probably exceed $15,000,000. The work is being taken up in divisions, each involving the irrigation of specified areas.

Storage is provided by erecting dams at the outlets of several mountain lakes, the capacity of which will total 804,000 acre-feet. On the Sunnyside Unit the government purchased a large canal, enlarged it and rebuilt the diversion dam in the Yakima. Last year this system supplied 40,000 acres, and a crop census showed that the yields amounted to $2,000,000 or $50 per acre.

No section of the United States gives

more generous returns for the labor employed than the Yakima Valley. I have never dared to tell Easterners what I really know to be true about the crop yields. Some of the views will give you an idea of the intensive farming practiced there.

Among the wealth producers the apple orchards take a high rank. Full-bearing orchards produce frequently from $300 to $1,200 per acre annually. It can be stated that $300 is less than the average for all well-kept orchards. The fruit grown here is attractive, sound, and ships well. Its market is New York and Europe, and the commission men are so eager for the crop that it is often contracted for in advance. Orchard lands sell for from $300 to $2,000 per acre, depending on location and condition of trees. The pear crop is very profitable, and peaches and grapes do well. A large area is in hops, and the yields here are so generous that I am told Yakima is driving New York out of the hop-growing business.

The Yakima Indians find employment in the hop fields during the picking season, and usually camp just outside the fields. Alfalfa is another money-maker, producing from 6 to 8 tons per acre, worth on an average of $5 per ton in the stack. In 1907 the Yakima Valley shipped fruit to the value of $1,125,000. Its hay crop was worth $2,000,000; potatoes, $250,000; onions, $50,000, and hops, $200,000, a total of farm products of $3,625,000. Sixty-five thousand cattle and 20,000 sheep were ranged and fed in this valley in 1907, valued at about $2,000,000.

Ten and 20 acre farms are common in this valley, and this has brought about compact rural settlements along the irrigation canals. In turn there has followed a gradual improvement in social conditions, with the elimination of the isolation of farm life, which has in itself proven such an important factor in swinging the pendulum of population from the farm to the town. The luxuries of town life are enjoyed in a measure by the farmer, who at the same time lives a life of freedom in the open.

When the works on this section are completed the Yakima Valley will become one of the show places of the country. Over a greater portion of the irrigable area the farms will not exceed 20 acres in area, and we may look for a population of 250,000 in this favored region in the not distant future. Fully developed, the taxable property should have a value of not less than $70,000,000, making it one of the richest agricultural districts in the world.

The area which can be reclaimed is nearly double that which is now irrigated in Southern California. A splendid part of the life in the Yakima Valley is that one can live out of doors so much of the year. The same share of clear skies and dry air that makes Southern California so attractive is enjoyed in Washington. The valley is on the main line of the Northern Pacific and the new line of the Chicago, Milwaukee and St. Paul Railway now building.

OKANOGAN PROJECT, WASHINGTON

The Okanogan country lies about half in British Columbia and half in the United States. Owing to its remarkable climate this valley has been called the California of the Northwest. The Reclamation Service has nearly completed an interesting engineering work here to reclaim 8,000 acres. The land is very fertile and, owing to the exceptionally favorable climate, a wide variety of products, many of which are high priced, are produced. Frost has never injured the fruit in the valley in which this work is located, and there has never been a failure with apples, peaches, plums, prunes, apricots, pears, cherries, nectarines, grapes, and all the varieties of small berries grown in the United States. The nearest railway town is Wenatchee, on the Great Northern, from which place steamboats ply daily up the Columbia to Brewster, and thence by stage 28 miles to Okanogan, a town of 400 inhabitants.

UMATILLA PROJECT, OREGON

The Umatilla project, in northeastern Oregon, when compared in area with many others now under construction,

ONE ACRE OF CONCORD GRAPES IN ORCHARD OF WILLIAM SQUIRE, NEAR ZILLAH, WASHINGTON, UNDER SUNNYSIDE CANAL

might be regarded as one of the lesser works, but when studied as to its possible future development it easily takes a prominent place among the most favorable and attractive agricultural regions in the West.

No expert who has investigated this wonderful land of sunshine has yet dared to place a limit upon its agricultural possibilities. Nature here gives the maximum return for the minimum of labor.

The irrigable lands lie in rolling benches along the Columbia and between it and the Umatilla. The diversity of crops, many of which are high priced, made possible by the exceptionally favorable conditions of soil and climate, predicate small farms intensively cultivated, providing homes for an intelligent and prosperous husbandry. The promise of a compact community of scientific agriculturists in this valley is certain of fulfillment in the near future. From the nature of the crops and the character of the people who will grow them it requires no particular gift of prophecy to predict the establishment in this valley of a rural settlement which will be likened unto many of those nearly ideal communities which have grown up under methods of intensive irrigation in Southern California.

The water supply is the flood flow of the Umatilla, which is stored in a reservoir created by constructing an earthen embankment nearly 100 feet in height and one-half mile long. Owing to the exceedingly porous character of the soil, many of the canals are lined with cement. The line of the Oregon Railroad and Navigation Company passes through the irrigated area.

TRUCKEE-CARSON PROJECT, NEVADA

On the western border of the Great Interior Basin in the bed of ancient Lake Lahontan, in Nevada, an important work is now completed to irrigate 160,000 acres. This is the dryest part of the United States except Death Valley, and was called "Forty Mile Desert" by the gold hunters who crossed it en route to California. The old overland trail can still be traced across the desert, and we come upon many melancholy evidences of desert tragedies, enacted in the early fifties. In excavating canals our great shovels have encountered the bones of men and horses who perished of thirst. We know now that much of their suffering was unnecessary. There is plenty of good water not far below the surface of the sands. In fact, the grave-diggers, if they had gone a few feet deeper, would have been able to satisfy their own thirst. The irrigation works in this valley in a way have changed physical geography. The Truckee River is lifted from its bed by a huge dam 30 feet high, which turns the waters into a broad and deep canal 31 miles long and lined with cement. Truckee River is now flowing into Carson River. Another dam in Carson River diverts the combined flow of both streams upon the desert, which has already begun to blossom. Eight hundred farms are now awaiting settlers here. The terms are easy and the market for farm products is the best in the West. You reach this valley on the Southern Pacific Railway.

KLAMATH PROJECT, OREGON-CALIFORNIA

The Klamath Project contemplates the reclamation of about 190,000 acres of land situated in Klamath county, Oregon, and Modoc and Siskiyou counties, California. The plans involve, in addition to the irrigation of the valley lands, the reclamation by drainage and future irrigation of a portion of the Lower Klamath and Tule lakes, lands which are now either swamp or lake bottoms. Practically all the uplands, which include the greater part of the project, are held in private ownership, mostly in large holdings, which, under the terms of the Reclamation Act, must be subdivided into tracts of not to exceed 160 acres. The public lands under the project, which include nearly all of the lake and swamp areas, are at present withdrawn from entry. When these lands are restored to entry, homesteaders may file applications for available public lands.

Construction work on the first 9 miles

of the main canal and the laterals thereunder was begun in March, 1906, and completed in 1907. From this canal water will be delivered to from 12,000 to 15,000 acres during the irrigation season of 1908. The lands under the project are of good quality. The principal crops grown are alfalfa, wheat, oats, barley, rye, vegetables, and some deciduous fruits. A few experiments in sugar-beet culture show that it is probable this crop can be successfully grown. The principal town of the valley is Klamath Falls, located on Link River about one mile below the lower end of Upper Klamath Lake. Other towns in the valley are Merrill, situated near Tule Lake, and Bonanza, situated on Lost River, within the so-called "upper project." The California and Northeastern Railway is now under construction to Klamath Falls.

YUMA PROJECT

President Roosevelt is responsible in a measure for the present widespread interest in the delta of the Colorado River, having made it the subject of a special message to Congress last session. This region has been likened unto the wonderful valley of the Nile, which it so greatly resembles in soil, crops, and climate. The world is familiar with the catastrophe which threatened for a time to destroy a very large area in the lower valley, but few people appreciate the almost superhuman engineering feat by which this powerful stream was forced back into its old channel. This was accomplished by the engineers of a great railroad company, which placed at their disposal vast sums of money and almost the entire equipment of the system. Since the river was controlled the government work at Yuma and above has progressed rapidly. The great weir at Laguna is now within 700 feet of closing the river, and during low-water stage this year heroic efforts will be made to complete this structure. The Laguna dam is interesting, as it is the first structure of this kind to be erected in the United States. It is similar to several weirs built by the English engineers in Egypt and India.

The project contemplates the reclamation of about 100,000 acres in Arizona and California. These lands are without question the most valuable in the country when watered. President Roosevelt, in his message to Congress, said: "The most conservative estimate after full development must place the gross production from this land at not less than $100 per acre per year, every 10 acres of which will support a family when under intensive cultivation. Much of the land will be worth from $500 to $1,500 per acre to individual holders." Yuma, the principal city in this section, is on the Southern Pacific Railway.

A VANISHED RACE

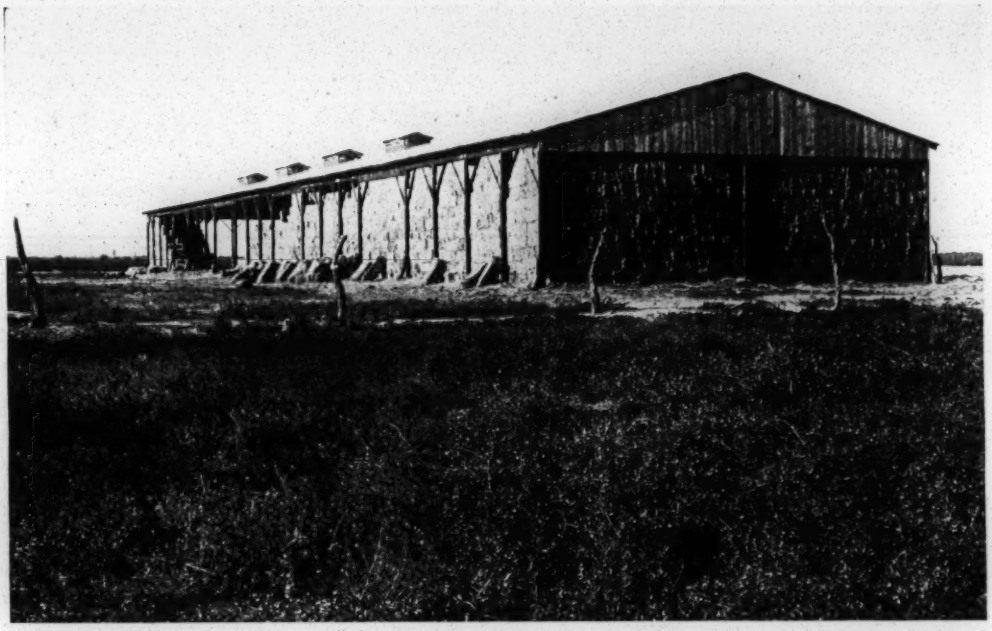
A peculiar interest attaches to our far Southwest, for the reason principally that long before the first word of our Nation's history was inscribed a semi-civilized people dwelt there and cultivated its fertile soil. Impenetrable mystery envelopes the age in which they lived. With four centuries of our own records to scan, supplemented by seven centuries of Moki traditions, the veil of the past thus parted throws no ray of light upon this ancient race. Their wonderful dwellings, perched eyrie-like in the deep canyons, and the long lines of their canals, choked with the wind-swept drift of centuries, give mute and pathetic evidence of their architectural and engineering skill.

Frowning battlements overlooking the desert, crumbling slowly into dust with the weight of ages, breathe of war and romance in an age forgotten. These monster structures, containing millions of pieces of stone, and the miles of canals which embraced whole valleys, tell of a thrifty home-loving husbandry. In these voiceless and vacant ruins we may almost read the story of Egypt of the scriptures, of another people toiling under the desert's brazen skies, wearily and painfully executing the commands of another Pharaoh.

What Fate overtook them we shall never know. Yet among these castled cliffs we know that men have lived and died, and youths and maidens have re-

REMAINS OF A VANISHED RACE (SEE PAGE 268)

THE CAPITOL GROUNDS FROM THE SOUTHWEST CORNER OF THE CAPITOL BUILDING, PHŒNIX, ARIZONA, SHOWING VARIETY OF VEGETATION



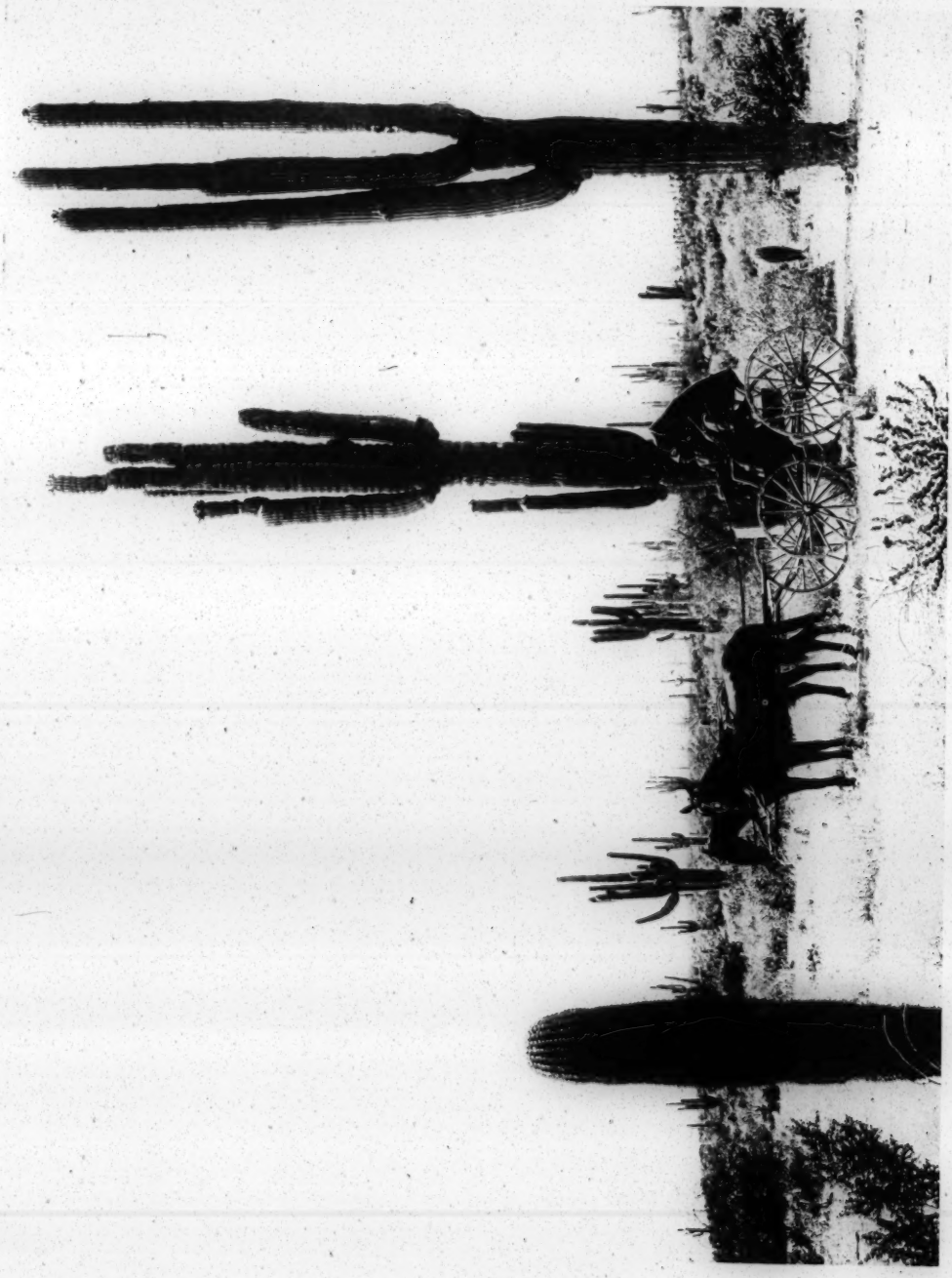
BALED HAY STORAGE BUILDING AT THE CHANDLER RANCH, 6 MILES SOUTH OF MESA, ARIZONA. WATER IS SUPPLIED FOR THE IRRIGATION OF THIS HAY BY PUMPING PLANTS: SALT RIVER PROJECT, ARIZONA

peated, o'er and o'er, the old, sweet story. We confess to a feeling of sadness as we view these structures erected in an age unknown—structures revealing order and intelligence, craftsmanship and patience, and rivalling in some degree the work of modern engineers. The Cheltro Palace is 449 feet long, 250 feet wide, and 4 stories high. Along three sides of it extends a wall 950 feet long and 40 feet in height. The masonry work in this building and wall contained more than 30,000,000 pieces of stone. All had to be quarried, then carried up steep ladders in baskets on the backs of men before being placed in position. Considering the primitive stone implements used and the magnitude of this structure, the time and labor required to construct this building make it the most famous and stupendous work of our country.

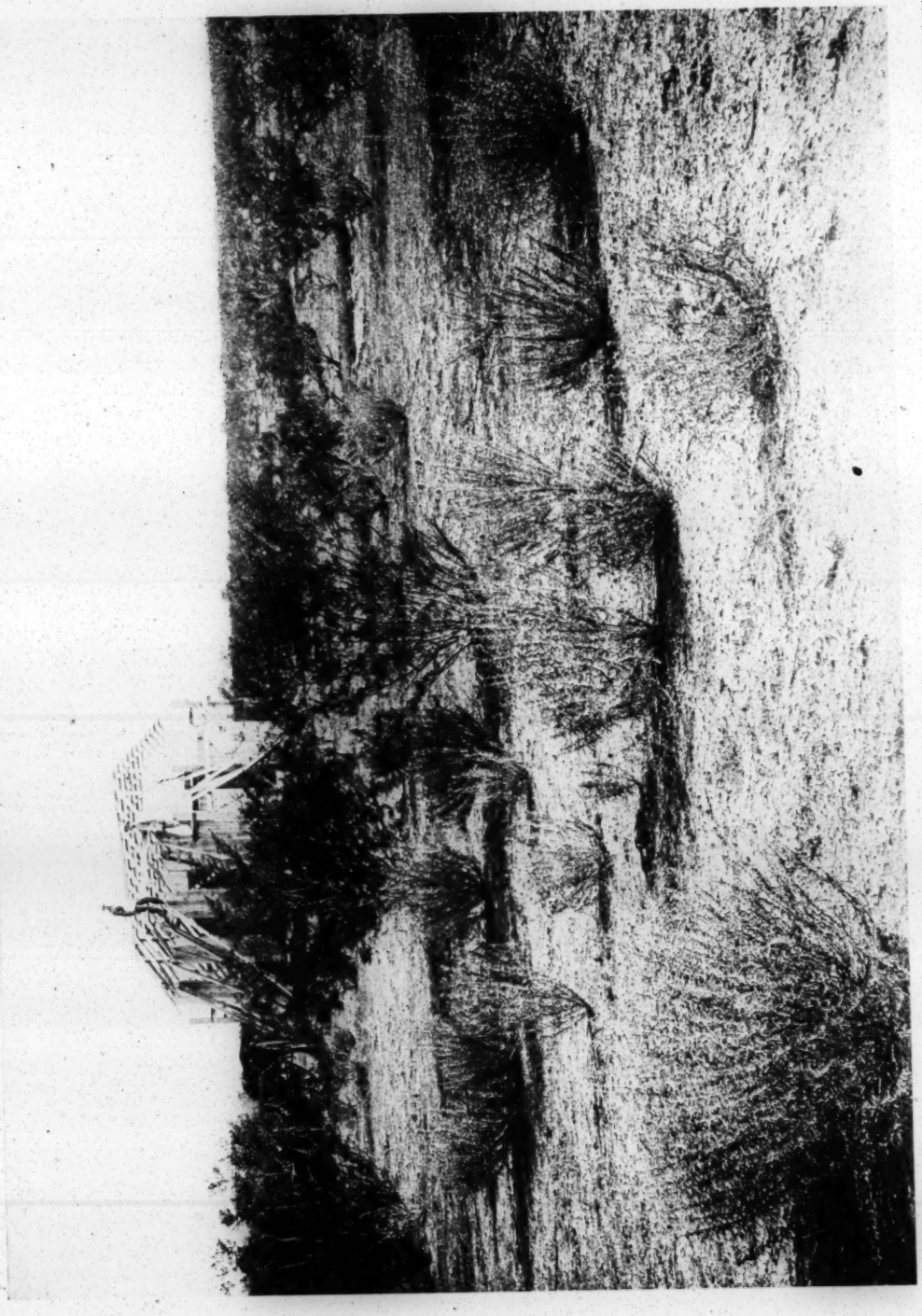
SALT RIVER PROJECT, ARIZONA

Let us in fancy visit this land of mystery, of lost races and hoary ruins, a land whose civilization was old perhaps when Cæsar sat upon his throne. Starting from the charming city of Phœnix, in the heart of Salt River Valley, let us take a journey to the wonderful engineering works of this project. Leaving Phœnix by train, the Santa Fé or Southern Pacific railways, it is only a short ride to Tempe, where we may profitably pause a moment or two to get a broad view of the valley from the summit of the high butte just at the edge of the town. We note a peculiarity here as we gaze upon the cultivated fields. There are no farm-houses on the farms. Here we find a return to the communal system of farm life, which was typical in the days of the cliff-dwellers and later in those of the Pueblo Indians. The farmer lives in town and goes to and from his small farm each day. Here at last the farmer's wife has her innings. She has the society of her neighbors, her children have graded schools; the church and library are at hand. There is no isolation, no

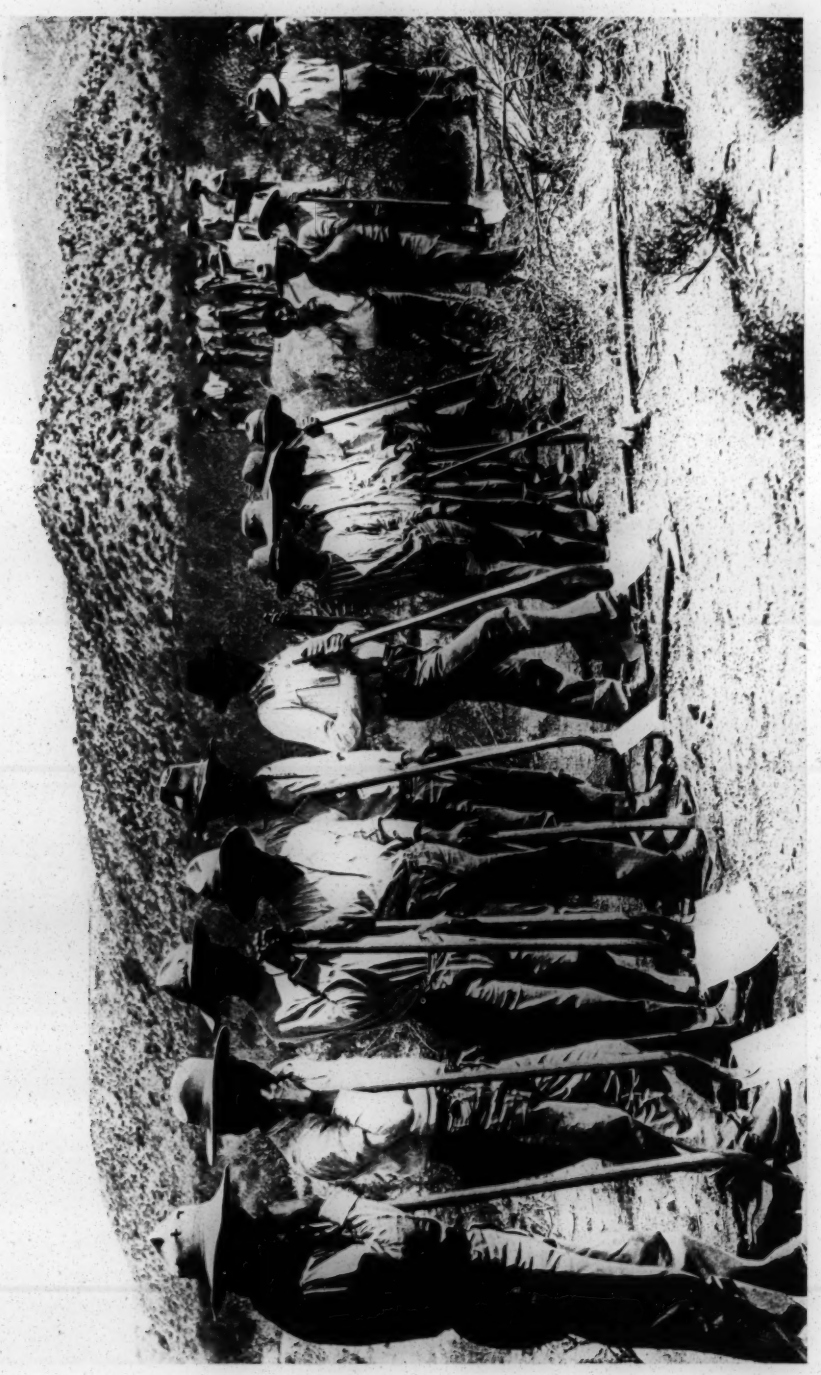
CHOLLA CACTUS ON THE DESERT BETWEEN GOVERNMENT WELLS AND DESERT WELLS, ROOSEVELT ROAD: SALT RIVER PROJECT, ARIZONA (SEE PAGE 277)



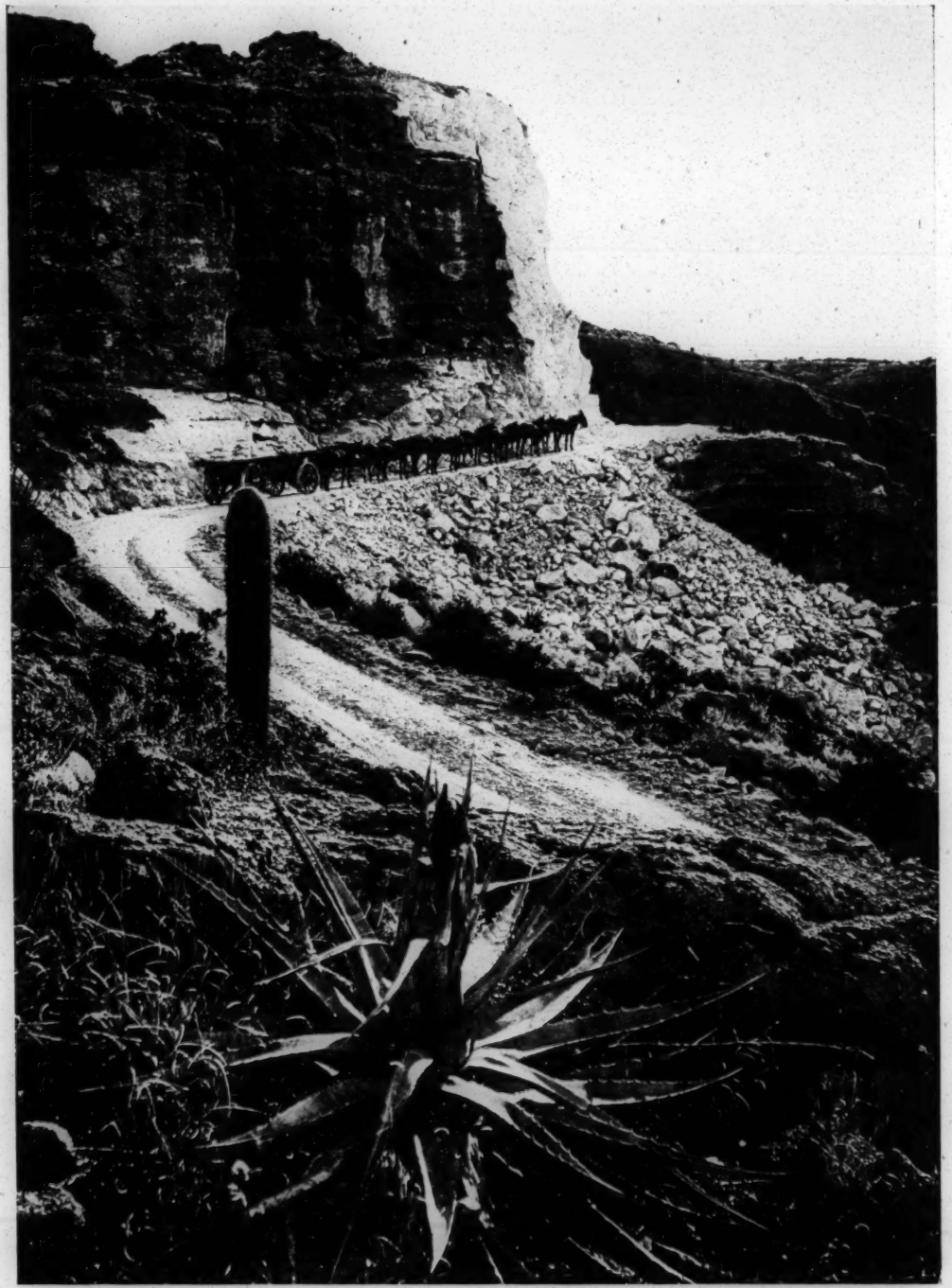
THE GIANT CACTUS ALONG THE ROAD TO GRANITE REEF, ARIZONA: SALT RIVER PROJECT (SEE PAGE 277)



BUILDING HOMES ON THE DESERT IN ANTICIPATION OF THE OPENING OF THE GOVERNMENT WORKS: SALT RIVER PROJECT, ARIZONA



PURE-BLOODED APACHE LABORERS CONSTRUCTING A ROAD THROUGH THE DESERT: SALT RIVER PROJECT, ARIZONA (SEE PAGE 279)



THE TOP OF FISH CREEK HILL, ARIZONA, ON THE MESA AND ROOSEVELT STAGE ROAD, WHICH WAS BUILT BY THE GOVERNMENT: SALT RIVER PROJECT, ARIZONA (SEE PAGE 278)

loneliness. We find under these conditions also that there is no strong tendency on the part of the young men and women to drift to the crowded cities.

From Tempe to Mesa is another short ride by rail through a well-irrigated section. Leaving Mesa in the early morning, when the air is fresh and sweet with the perfume of countless blossoms, we journey for a distance of 8 miles through a region where nature seems to be ever at work producing varied and wonderful forms of vegetation. Just beside our window we note the magnificent date palm, its broad leaves bending in graceful curves and shading an abundance of luscious fruit. We are, indeed, in Egypt, for the date, you remember, was the bread of the desert. If we doubt, a little further along we come upon an olive orchard, and just beyond the almond trees are in bloom, lending fragrance to an atmosphere already perfumed.

We pause to observe a large flock of ostriches wandering over an alfalfa meadow and rub our eyes to be sure we are really in our own country. More familiar to us appear the sleek, fat cattle standing knee deep in the cool alfalfa. This alfalfa is a wonderful crop down here, a veritable farmer's bank account, frequently yielding 12 tons to an acre per year, worth from five to ten dollars per ton.

We linger just a moment to gather a few oranges from the grove beside the road, and as we eat we wonder why such fruit never comes to our tables.

There is such a riot of color about this cottage that we want to stop long enough to ask the housewife how she can get roses to bloom in this wonderful way, but we have a long journey and we only learn that most farmers' wives in this valley, having both time and inclination, delight in beautifying their homes.

"THE LAND THAT GOD FORGOT"

All too quickly we have driven over this flowery, fruitful vale. With a suddenness that is startling we come upon a scene of death and desolation, where everything bears mute evidence of a terrible struggle for life. It is the land some one called "The Land that God Forgot." Everything that grows is covered with a thorn; everything that crawls is deadly. It is a topsy-turvy wonderland. We may not drink of the waters of the desert stream, for they are salty. In this strange region they dig for wood and climb for water, for the water is found in cup-shaped pools in the hills and the wood is the big root of the mesquite.

For 20 miles our road, a government road, stretches across the desert and we begin to feel some of its compelling and pervasive mystery. There is a beauty and charm about it, too, which cannot be described. The distant buttes are glowing richly red in the early morning light and the landscape, some one has said, "suggests a thought of God's original palette whereon he mixed the colors with which he brought forth the glories of a southwest sunset," the opal-tinted morn and the fairest shades of rose and green and yellow.

The desert vegetation is interesting. We come upon the Sahaurra, the giant cactus, the sentinel of the desert, clothed from base to top with thorns, yet bearing delicate and waxen yellow blossoms. Singly and in pairs they grow, some attaining a height of 45 feet. Sometimes we find them in groves. The cliff-dwellers used the heart of this plant for floors in their houses.

Our first stop in the desert is at Desert Wells. It remained for our generation to discover that underneath these burning sands, and at no great depth, is an inexhaustible supply of water, fresh and sweet. At several points along our way the government has put down these wells to supply the needs of the thousands of men and teams constantly crossing the desert.

Rising straight up from the desert is a distant range of mountains. They seem to float above the edge of the level plain, intangible and unreal, yet transcendently beautiful in coloring and contour.

As we enter the mountain country glory after glory of view is presented. Changeful, charming landscape pano-

ramas are unfolded before us. The colors illusive and divinely artistic, shift and change and blend as we gaze in wonder and amazement.

THE MOST WONDERFUL HIGHWAY EVER BUILT BY MAN

We are now entering upon what many travelers have described as the most wonderful highway ever made by man. A great thoroughfare built for 40 miles through the heart of a rugged range of mountains and for the most part literally carved from the living rock. As we go along note the coloring on the rocks, and believe me when I tell you the colors shown are not exaggerated, for it would be impossible for human artist to duplicate, far less to exaggerate, the colors which the Divine Hand has put upon these stones.

I need not tell you that road-building in a country like this was difficult; that fact stares you in the face at every point. When the surveying party reached the top of Fish Creek Hill the engineer called a halt. He wanted time to think; and the problem before him demanded thought. He looked over the cliff into a blind canyon, into which there was not even a foot trail. A thousand feet sheer below him he could discover faintly a tiny stream of water and a few green trees. How was he going to get there with a wagon road over which tons and tons of machinery must be hauled? A hurried reconnaissance disclosed the fact that to go around the canyon meant adding 15 miles to the road. It was not to be thought of. So he decided to blast a road down the face of the steep cliff, and it was done.

It would be simply terrifying to go over the road today but for the fact that the government has built it broad and comfortable, with easy grades and many safe turnouts, for standing here at the edge of the road a pebble slipped from the fingers shoots almost straight down a thousand feet without stopping.

At one point we get a view of the road almost to the blind end of the canyon, and can also see the line of road as it turns back on the other side. Just before we make this turn we cross a pretty little bridge 60 feet above Fish Creek. Down in the bottom of the canyon we find Frazier's Road House, a comfortable little inn, with good beds and a genial landlord. Here we shall spend the night. In this canyon, a miniature grand canyon of the Colorado, we will witness the golden glory of a sunset whose splendor will be impressed forever on our memory. Later we shall sit in the twilight and watch the stars steal forth in skies that seem to touch the walls of the canyon all around us.

The brooding mystery of the scene and the witchery of the hour will sink deeply into our hearts and color our dreams for many nights hereafter.

In the morning early we make our start to climb out of the canyon. Another panorama of mountains, uncanny buttes, steep-walled canyons, and narrow valleys passes before us. Freakishly shaped rocks, grotesque and awe-inspiring, tower above us. What wonder that the Indian viewed the country with superstition and awe!

At places we skirt dark chasms. Here the road has been cut from a rock that is milk white. Here the mountain-top was blasted off and the road built from the river up. Here we have a long swing on the edge of a profound forge, and as we pass along we are thankful indeed that our road is wide and safe.

Higher and higher we climb, every moment catching glimpses of difficult problems in road building worked out successfully. We pass through great cuts, and here and there the road has been built up from below with masonry.

THE ROOSEVELT DAM AND OTHER MARVELS

Our road has brought us to the top of the narrow gorge Salt River has cut through the mountains, and we look down upon one of the world's greatest engineering works in process of construction, the Roosevelt dam. This wonderful structure of sandstone and cement will rise 284 feet above the river. It will be 1,080 feet long on top and 170 feet thick

XUM

at the base. Its foundation will cover one acre of ground.

Placed by the side of a 20-story building, it would rise ten feet above it, while its length on top would be more than two city blocks. Across its top will be a roadway 20 feet wide.

By day and by night the dull roar of dynamite breaks the desert stillness, and the canyon walls go crashing down to furnish material for this structure. Great blocks of sandstone weighing ten tons each are swung out on cranes and set in place.

When night comes myriads of electric lights burst forth, weirdly illuminating a busy army of toilers, working gnome-like in a shadowy canyon. It is a wondrous scene, unreal, awesome, and inspiring.

Every stone that is laid in that narrow arch, which is to curb that foaming river, brings nearer and nearer the day when the town of Roosevelt shall vanish beneath an inland sea.

When those massive gates of iron in the big dam, weighing 60,000 pounds, are closed, a rising flood will cover the site of the city 220 feet deep. The people knew it was a doomed city when they built it, but this did not deter them. They built stores and dwellings, a school-house and a church, and brought water from distant mountain springs.

This government work is interesting not only to the engineer, but also to the layman. It is located in a valley which has been the abode of three races, one of which lived here when Rome was young. Two of those wonderful cliff-dwellings are almost in sight of the modern structure that is soon to submerge some of the lands which formerly produced their harvests.

Owing to the remoteness from transportation, the government engineer had to engage in many enterprises. He built roads to get machinery in. He sawed millions of feet of lumber from the national forests nearby. He turned farmer and raised his own produce, his hay, pork, beef, and chickens. In the construction of the dam 240,000 barrels of cement are required and the lowest bid from the cement manufacturers was prohibitive. This engineer, undaunted, found a limestone ledge near the dam and proceeded to erect a cement mill. It has already turned out 80,000 barrels of cement at a cost far below the lowest bid.

Power was essential, so a dam was built 16 miles upstream, turning a part of the river into a power canal. The canal, having less grade than the river, appears to carry the water uphill.

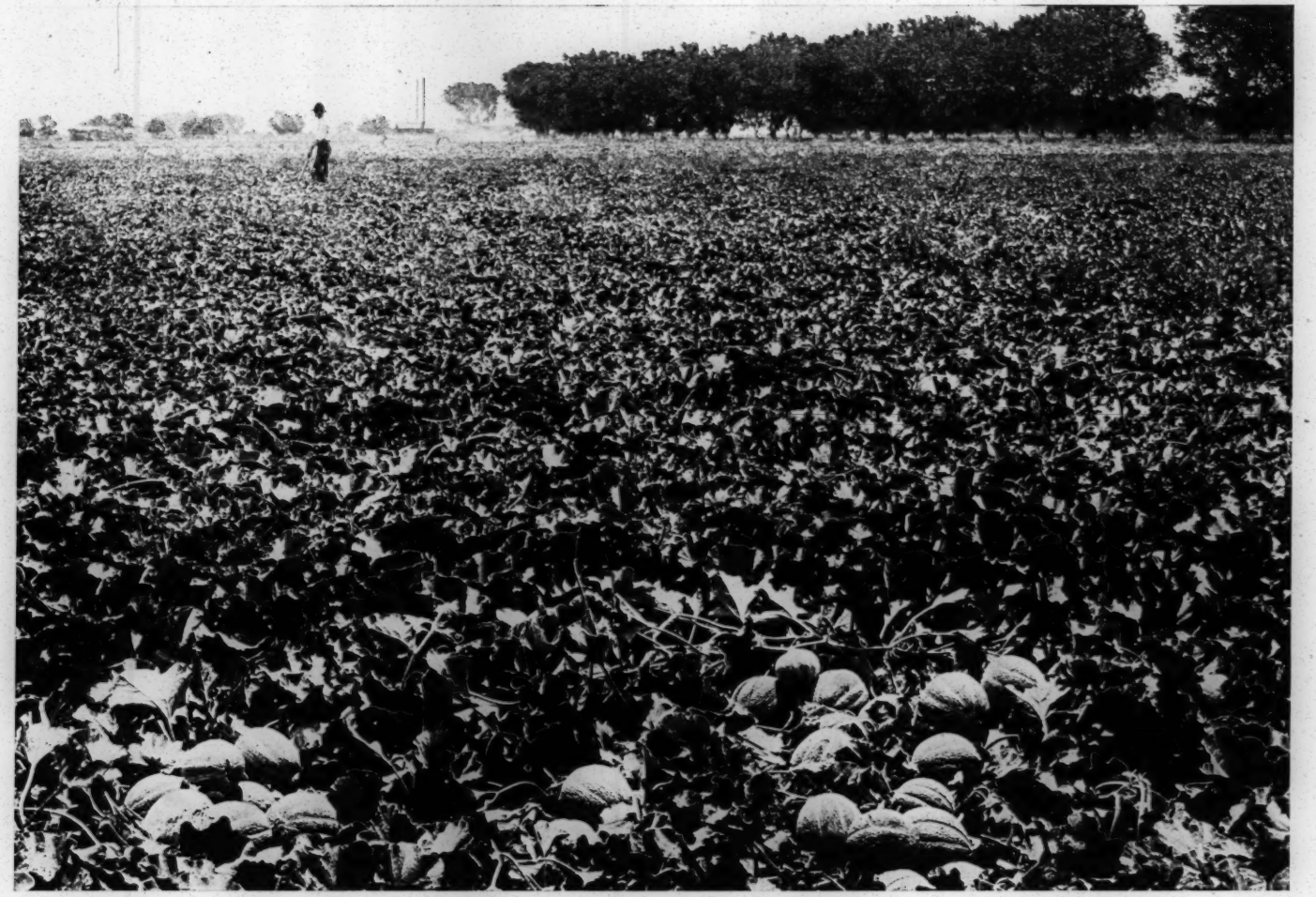
A part of it is lined with cement. It crosses rough country in viaducts that make us think of the works of ancient Rome. Near the dam site it passes through a tunnel and downward into the mountain, a drop of 220 feet. The water falls upon the turbines located in a unique power-house, a niche in the canyon walls, and generates 4,400 horse-power. The power is utilized by the contractor, it operates the cement plant, the electric-light plant, and is used for other purposes.

THE APACHE LABORERS

On the way to the saw-mills we pass a number of salt caves, each of wonderful beauty. The salt is deposited by salt springs. It is from these springs that the river takes its name, for the waters of Salt River are too salty to drink, but fortunately not salty enough to be injurious when used for irrigation.

The most difficult problem for the engineer to solve was the labor question. The common laborer did not like the job, chiefly, it is said, because he could not spend his money fast enough. This is a government reservation; there are no saloons; no gambling is permitted. There are no towns nearer than 60 miles, so he did not look with favor on the work. The real worth of the engineer came out when he turned missionary and held a pow-wow with the Apache Indians, who have lived in the basin for generations. It seems incredible, yet it is nevertheless true, he succeeded in inducing several hundred of them to go on the pay-roll, and, largely through their labors, the wonderful highway we just crossed over was built.

Some of the Apaches developed. Sev-

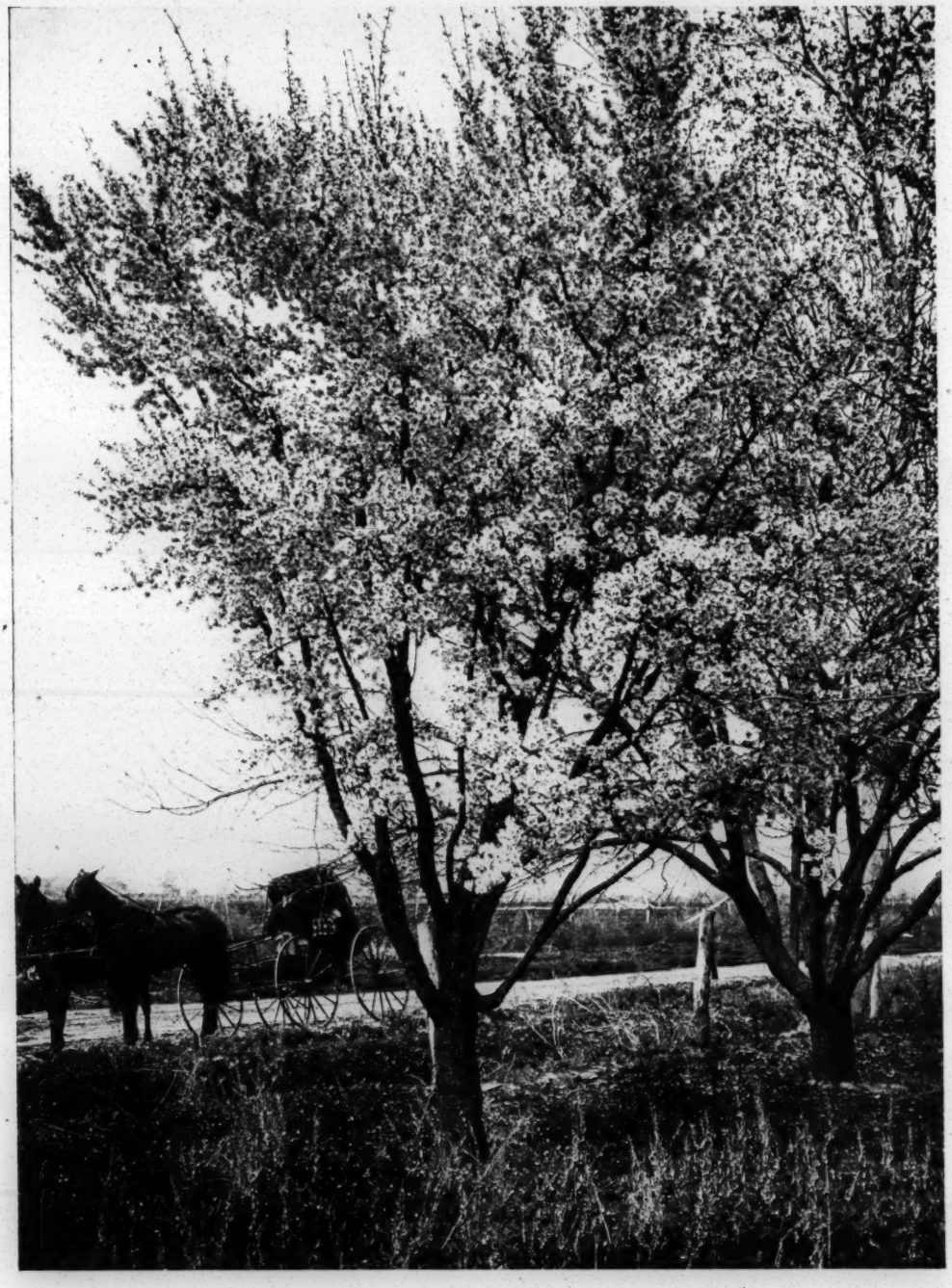


RAISING MELONS IN THE SALT RIVER VALLEY, ARIZONA

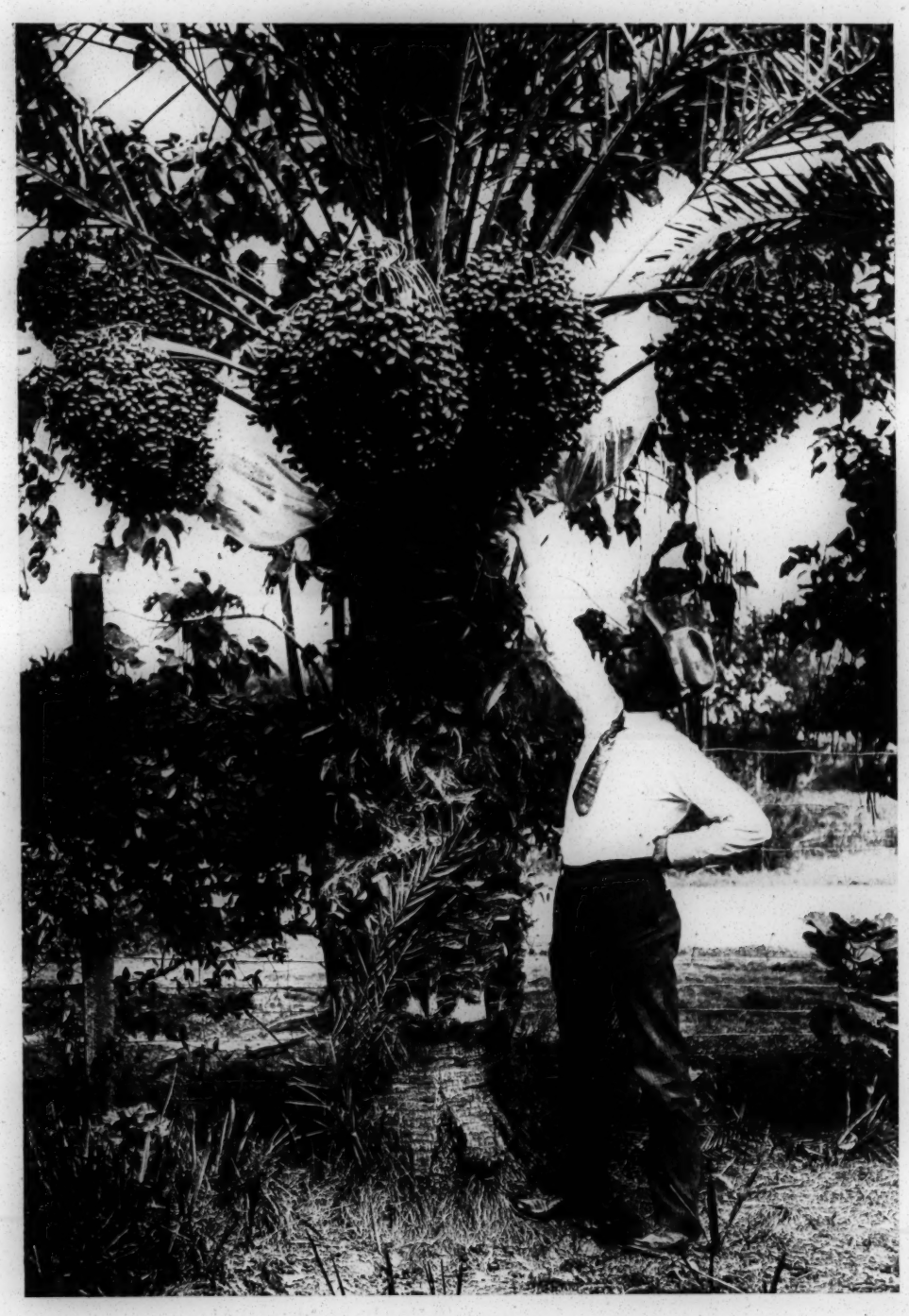
It is understood that the melon growers' crop average net per acre is $200, and gross $300 per acre. This industry is a very profitable one in the Salt River Valley

THE RAISING OF GRAPES IN THE SALT RIVER VALLEY, NEAR MESA, ARIZONA

With proper irrigation in this section of the Southwest almost any kind of fruit can be successfully and profitably raised. Grapes do very well in this valley



ALMOND ORCHARD IN BLOOM IN THE SALT RIVER VALLEY, ARIZONA: SALT RIVER PROJECT, ARIZONA



DATE TREE IN SALT RIVER VALLEY, NEAR MESA, SHOWING THE ENORMOUS CROP OF DATES ON ONE TREE: SALT RIVER VALLEY PROJECT, ARIZONA

THE IVY RANCH, NEAR PHŒNIX, ARIZONA: SALT RIVER PROJECT, ARIZONA

The bee industry in the Salt River Valley is a very profitable industry, as the climatic conditions are perfect, and the clover and alfalfa fields, as well as the wild mesquite, affords good feed for the bees, making this section of the country very well adapted for this business.

eral, starting as common laborers, showed such industry and ability that they were promoted to responsible positions, as road supervisors in charge of their own tribesmen on difficult road work.

There is something like poetic justice in the labor of the Indian with pick and shovel to reclaim a valley he so often watered with the blood of the white man.

While the braves are working for the government on the road, in the cement mill, the brick-yard, and elsewhere, the squaws in the teepees weave wonderful baskets, which find ready sale in the camp and in the valley below.

Sixty miles below Roosevelt another enormous structure is rapidly nearing completion. It will divert the stored waters into canals on each side of the river which lead it to the fields below. One of these canals was partly excavated by the cliff-dwellers, who cut it through solid rock. Think of the patience and time they must have expended in a work like this, when their only implements were of stone.

Settlers are already erecting their homes on the desert, and soon we shall call this the land that God remembered, for, with water from those distant mountains stored in vast reservoirs and led through a thousand miles of canals and ditches, the desert will smile, oases of green will spring forth, and homes of beauty and peace will dot the landscape.

TERMS OF SALE OF GOVERNMENT LAND

If the thousands of inquiries which are addressed to the Statistician of the Reclamation Service, at Washington, D. C., can be accepted as any indication, the West will be the Mecca for hundreds of home-seekers this spring. Many other projects of the government which are ready for irrigation contain large areas of land for sale by private owners who are under agreement with the United States to dispose of their holdings. By the terms of the Reclamation Law no farm will contain more than 160 acres. Every settler must reside upon the land, and must cultivate it for five years before he can secure a patent. The homestead rights of soldiers and sailors are not abridged by the Reclamation Act. Home-seekers should have money—how much depends, of course, upon the settler and the kind of farming he expects to do. While there are numerous opportunities to secure work, the settler with money and equipment will be able to get his land in condition for irrigation and will thus secure an early income from his farm.

A knowledge of irrigation is not absolutely essential. The government will have a practical farmer on each project to advise new-comers. On several projects there are demonstration farms on which are grown the crops adapted to that section. During portions of the year the government will give employment to settlers in constructing canals, laterals, and building roads.

SUMMARY OF WORK DONE

A summation of the work of the Reclamation Service for 1907 shows that it has dug 1,881 miles of canals, or nearly the distance from Washington to Idaho. Some of these canals carry whole rivers, like the Truckee River in Nevada, and the North Platte in Wyoming. The tunnels excavated are 56 in number, and have an aggregate length of 13½ miles. The Service has erected 281 large structures, including the great dams in Nevada and the Minidoka Dam in Idaho, 80 feet high and 650 feet long. It has completed 1,000 headworks, flumes, etc. It has built 611 miles of wagon road in mountainous country and into heretofore inaccessible regions. It has erected and in operation 830 miles of telephones. Its own cement mill has manufactured 80,000 barrels of cement, and the purchased amount is 403,000 barrels. Its own sawmills have cut 3,036,000 feet B. M. of lumber, and 23,685,000 feet have been purchased. The surveying parties of the Service have completed topographic surveys covering 10,970 square miles, an area greater than the combined areas of Massachusetts and Rhode Island. The transit lines had a length of 18,900 linear miles, while the level lines run amount to 24,218 miles, or nearly sufficient to go around the earth.

The diamond drillings for dam sites

and canals amount to 66,749 feet, or more than 12 miles. Today the Service owns and has at work 1,500 horses and mules. It operates 9 locomotives, 611 cars, and 23 miles of railroad, 84 gasoline engines and 70 steam engines. It has constructed and is operating 5 electric-light plants. There have been excavated 42,447,000 cubic yards of earth and rock. The equipment now operated by the Service on force account work represents an investment of a million dollars.

This work has been carried on with the following force: Classified and registered service, including Washington office, 1,126; laborers employed directly by the government, 4,448; laborers employed by contractors, 10,789, or a total of all forces of 16,363. The expenditures now total nearly $1,000,000 per month.

As a result of the operations of the Reclamation Service eight new towns have been established, 100 miles of branch railroads have been constructed, and 14,000 people have taken up their residence in the desert.

The following is a list of the approved projects on which construction has been commenced. The table shows the irrigable area of the projects to the points to which it is expected to carry them during the four years 1908 to 1911; the estimated cost to complete the work to these points; the estimated expenditures to the end of the calendar year 1907; and the percentage of completion December 31, 1907, based upon the ratios of the expenses to that date to the total estimated cost:

Areas, Cost, Expenditures, etc., on Entire Projects or Such Units as it is Expected to Complete by 1911.

Location.	Project.	Area in acres.	Estimated cost.	Estimated expenditure to December 31, 1907.	Per cent of completion.
Arizona	Salt River	210,000	$6,300,000	$4,362,100	69.2
California	Orland	30,000	1,200,000	16,900	1.4
California–Arizona	Yuma	100,000	4,500,000	1,876,700	41.7
Colorado	Uncompahgre	140,000	5,600,000	2,900,000	51.8
Colorado	Grand Valley	50,000	2,250,000	9,750	.4
Idaho	Minidoka	160,000	4,000,000	1,839,700	46.0
Idaho	Payette–Boise	100,000	3,000,000	1,381,500	46.5
Kansas	Garden City	8,000	350,000	282,000	80.5
Montana	Huntley	30,000	900,000	796,400	88.4
Montana	Milk River, including Saint Mary.	30,000	1,200,000	314,800	26.2
Montana	Sun River	16,000	500,000	344,100	69.0
Nebraska–Wyoming	North Platte	110,000	3,850,000	2,797,300	73.0
Nevada	Truckee–Carson	160,000	4,800,000	3,804,600	79.2
New Mexico	Carlsbad	20,000	640,000	579,400	81.5
New Mexico	Hondo	10,000	370,000	358,600	97.0
New Mexico	Leasburg	10,000	200,000	167,900	83.9
New Mexico–Texas	Rio Grande	160,000	8,000,000	53,200	.6
North Dakota	Pumping, Buford–Trenton, Williston.	40,000	1,240,000	519,600	41.9
Montana–North Dakota	Lower Yellowstone	66,000	2,700,000	751,850	64.9
Oregon	Umatilla	18,000	1,100,000	765,500	69.6
Oregon–California	Klamath	120,000	3,600,000	1,305,080	36.2
South Dakota	Belle Fourche	100,000	3,500,000	1,281,900	36.6
Utah	Strawberry Valley	30,000	1,500,000	418,700	27.9
Washington	Okanogan	8,000	500,000	372,180	74.4
Washington	Sunnyside	40,000	1,600,000	481,180	30.7
Washington	Tieton	24,000	1,500,000	565,420	37.6
Washington	Wapato	20,000	600,000	5,220	8.7
Wyoming	Shoshone	100,000	4,500,000	2,313,990	51.5
		1,910,000	$70,000,000	$30,665,570	

An average of $36.65 per acre.

WATERMELONS IN YOUNG PEACH ORCHARD FARM, KERMAN, FRESNO COUNTY, CALIFORNIA

Showing profitable use of ground while orchard is being brought into bearing. Kerman is a new colony west of Fresno

Photos by Ellsworth Huntington

THE SEA OF SAND OF THE TAKLA MAKAN DESERT

THE SEA OF SALT OF THE LOP DESERT

MEDIEVAL TALES OF THE LOP BASIN IN CENTRAL ASIA*

By Ellsworth Huntington

THE modern West discovered the Lake of Lop-Nor, in Chinese Turkestan, only thirty years ago, yet in the Middle Ages Chaucer and his predecessors seem to have known as much about that region as the average man knows today. In recounting the virtues of the Duchess Blanche, Chaucer speaks of the sweet reasonableness with which she treated her many lovers. She did not hold them in suspense, nor for the sake of proving them did she:

> ". . . Sende men into Walakye,
> To Pruyse and into Tartarye,
> To Alisaundre, ne into Turkye;
> And bid him faste, anoon that he
> Go hoodless to the Drye See,
> And come hoom by the Carrenare."

Apparently the Dry Sea and the Carrenare were the most inaccessible regions of which Chaucer had ever heard, more inaccessible even than Wallachia, Prussia, Tartary, Turkey, and other erstwhile remote places of which he knew little. After much discussion by literary critics as to the geography of the places to which the Duchess did not send her lovers, Prof. J. L. Lowes† has shown that there can be little doubt that the Carrenare is the small salt lake of Kara-Nor, at the eastern end of Chinese Turkestan. It lies in the vast "Gobi" or "Desert" about 200 miles west of the supposed end of the Great Chinese Wall. As a matter of fact the remains of the wall extend not only to, but beyond the lake, as Dr Stein has recently discovered. Professor Lowes concludes further that the Dry Sea is the great sandy desert of Taklamakan, a few hundred miles to the west of Kara-Nor. It appears to be either this or the broad salt plain of the ancient bed of the Lake of Lop-Nor, between Kara-Nor and Takla-makan. The terrible summer heat and winter cold of the whole region make it indeed a place to which few people would be so hardy as to go "hoodless" at any season.

Apparently European knowledge of Central Asia in Chaucer's day was derived more or less directly from the famous Letters of Prester John, perhaps by way of the plagiarized accounts of Sir John Mandeville. Prester John was a semi-mythical Christian prince who is supposed to have lived in Central Asia, and who sent boastful letters to the Pope of Rome in the latter half of the twelfth century. The Letters aroused great interest in Europe for three or four centuries, and many attempts were vainly made to find the author's country. At first he was supposed to live in Asia, as was probably the case. Hundreds of years after the writing of the letters, however, the Portuguese heard of a Christian king living in Abyssinia, and, supposing him to be the great Prestor John, sent several expeditions to form an alliance with him. The vaunting boasts of the wide dominion and great splendor of Prester John, whose butler is said to have been a primate and a king, and his steward an archbishop and a king, are certainly false. Nevertheless the Letters contain a large amount of garbled truth, and their writer must have known a good deal more about Central Asia than has generally been supposed.

He tells us that, "Among other things which are very wonderful in our country is a sea of sand without water. For the sand moves and swells in waves in the manner of all seas, and is never still. This sea cannot be crossed either by boat or by any other method, and of what sort the land may be beyond it no one can know. And although water is absent

* Abstract of an address to the National Geographic Society, January 17, 1908.
† Modern Philology, vol. iii, 1905, pp. 1–46.

entirely, nevertheless there are found on the shore on our side many kinds of fish more delicious and sweet-tasting than are ever seen anywhere else." Other wonders are related of the same region. For instance, to quote Professor Lowes, "Into the Sandy Sea itself flows, three days of the week, a river of stones without water, impassable while its flow continues. Beyond it lies another river, whose sands are mere precious stones; or sometimes this River of Gems flows *through* the Sandy Sea, and is indeed the Sabbatic River, flowing six days and resting the seventh, which keeps the ten tribes of the Children of Israel from crossing into the land of Prester John. And in one part of the desert where the sea lies is a people with round feet, like horses' hoofs; and in another part is the land of Femenye itself," a land where none but women dwell, and they are "very stark and cruel;" and no man dare bide more than an hour.

THE SEA OF SAND

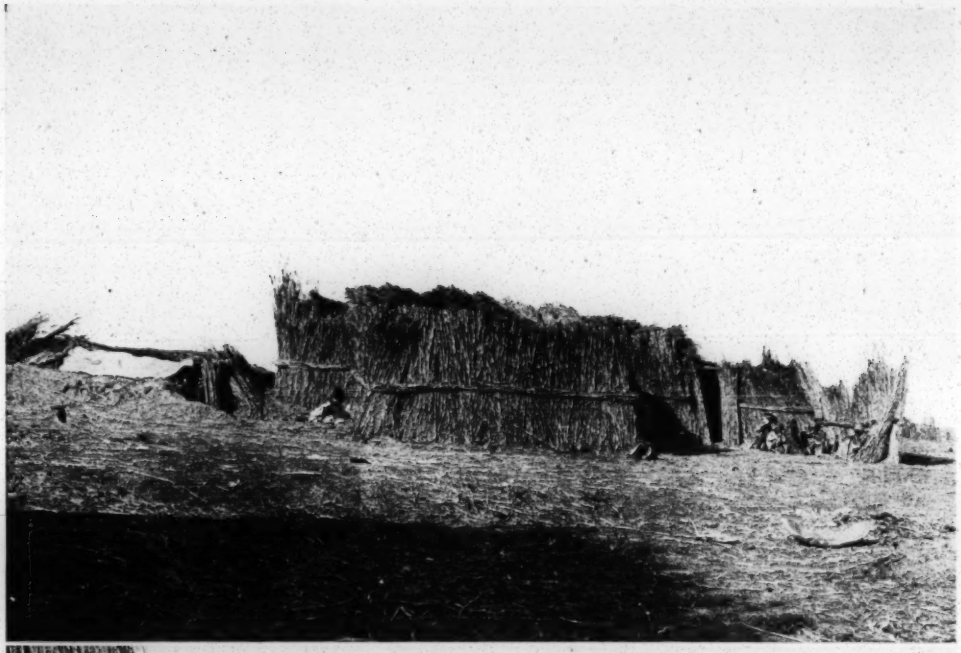
Strange as these stories sound, they are only slight perversions of the truth. During a visit to the Lop Basin in 1905–6 the writer observed facts which may perhaps explain all of them. For instance, when first one sees Chinese women of high class their diminutive feet are strangely suggestive of the hoofs of animals. As to the fable of the land of Femenye, there is nothing now to give rise to it directly. Marco Polo relates, however, that in his day in the region of Hami, not many hundred miles from Lop-Nor, none but women were found in the villages when caravans arrived. The men departed in order that the travelers might be more comfortable, and might be the more ready to pay for entertainment. Even today the people of Hami possess customs which seem to be a reminiscence of the ancient habit.

Other portions of the old accounts are equally explicable. The Lop Basin, in the very center of Asia, is a great depression, 1,400 miles long from east to west and 400 wide. Around it lies a ring of lofty plateaus from 10,000 to 20,000 feet high. At their base is a ring of piedmont gravel, almost destitute of life, and sloping gently inward like a huge beach from 5 to 40 miles wide. Then comes another ring, the zone of vegetation, where alone there are plants and an opportunity for human inhabitants other than the few nomads of the plateaus. Finally within the zone of vegetation lies a vast desert area about 1,000 miles long and 250 wide. Its western three-quarters consist of a veritable Sea of Sand, the Takla-makan desert, yellow or gray on the edges, pink in the inner portions. Row after row of almost impassable sand dunes has been piled up by the wind to heights of full 500 feet in places. The smallest dunes often move forward hundreds of feet in a year in the direction of the prevailing winds; the largest scarcely move at all. The sand is most beautiful, with its graceful sweep of wavy dunes and ripples, but the natives hate and fear it. It has proved the grave of many a native gone mad with thirst in the vain search for the gold supposed to lie hidden in sand-buried ruins.

A few rivers flow into the desert of Takla-makan. Most of them soon wither to nothing. All are very variable, and some, such as the Vash Sheri, flow in raging, impassable torrents during sunny weather in summer, but dry up when cloudy days among the mountains prevent the melting of snow. The dry beds of these "Sabbatic" streams form veritable "rivers of stones." In certain cases one might almost say with the old chronicler that there are streams "whose sands are mere precious stones." When the Khotan and Keriya rivers are low, crowds of natives go out from the oases to dig in the gravel of the river-bed for jade, one of the most highly prized of Chinese precious stones. Gold also is found in the upper parts of the beds of the Keriya and other rivers.

THE SEA OF SALT

East of the Sea of Sand there lies a Sea of Salt, the bed of the ancient Lake of



Photos by Ellsworth Huntington

A LOPLIK HOUSE OF REEDS

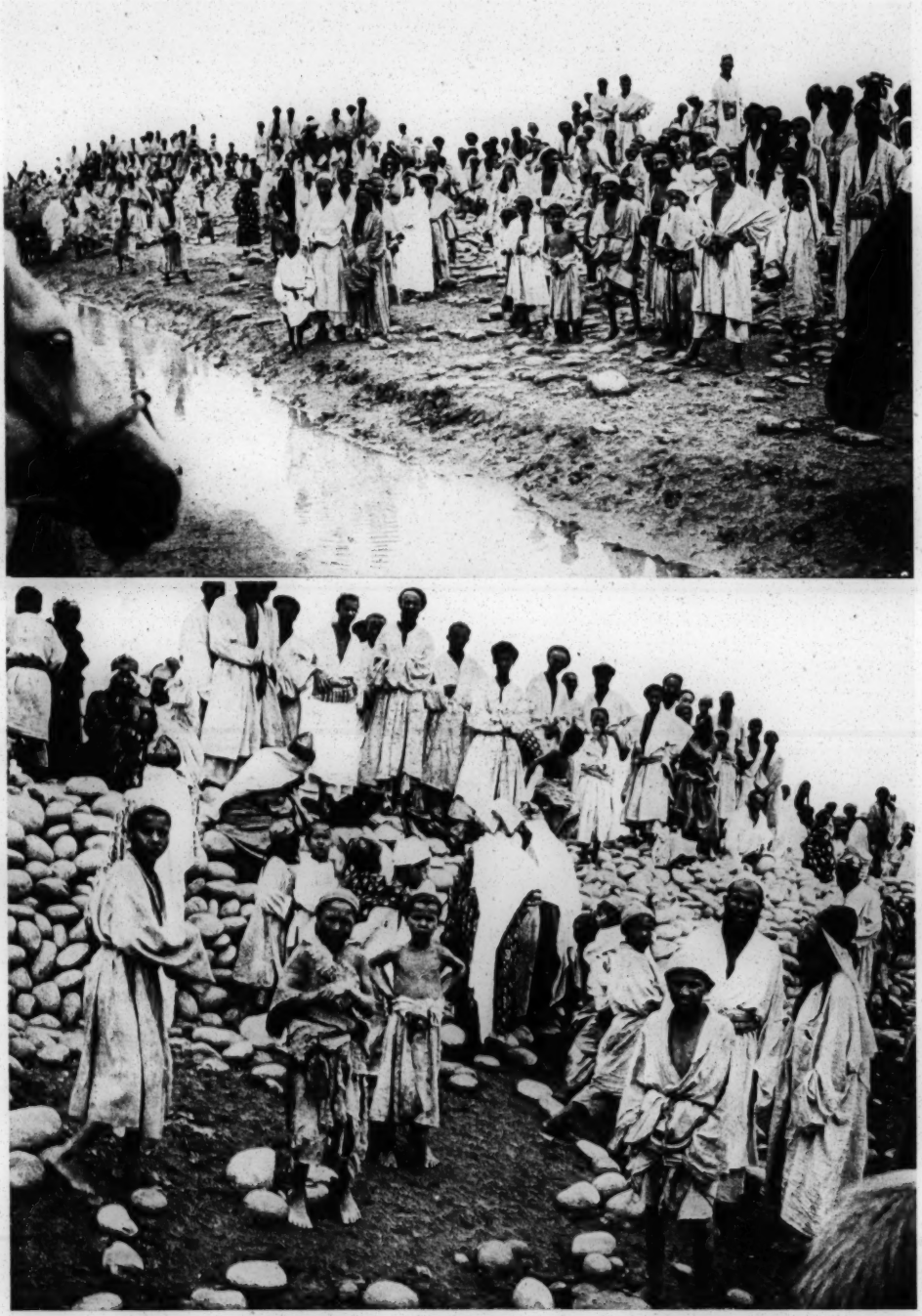
LOPLIK WOMEN AND CHILDREN

Lop-Nor. Today the lake is merely a marsh, fed by the Tarim River, and filled with huge reeds 12 or 15 feet high. Near the mouth of the river, where alone the water is fresh enough to support life, the Lopliks have planted their villages of reeds. Formerly, according to their own account, they lived wholly on fish and birds caught in the open lanes and pools of the swamp, where the fishermen still paddle their canoes of hollowed poplar. They cannot go far to the east, for there the swamp grows more and more saline, until finally it merges into a great plain of salt, the bed of the expanded lake of former times.

Photo by Ellsworth Huntington

ÆOLIAN EROSION IN THE LOP BASIN

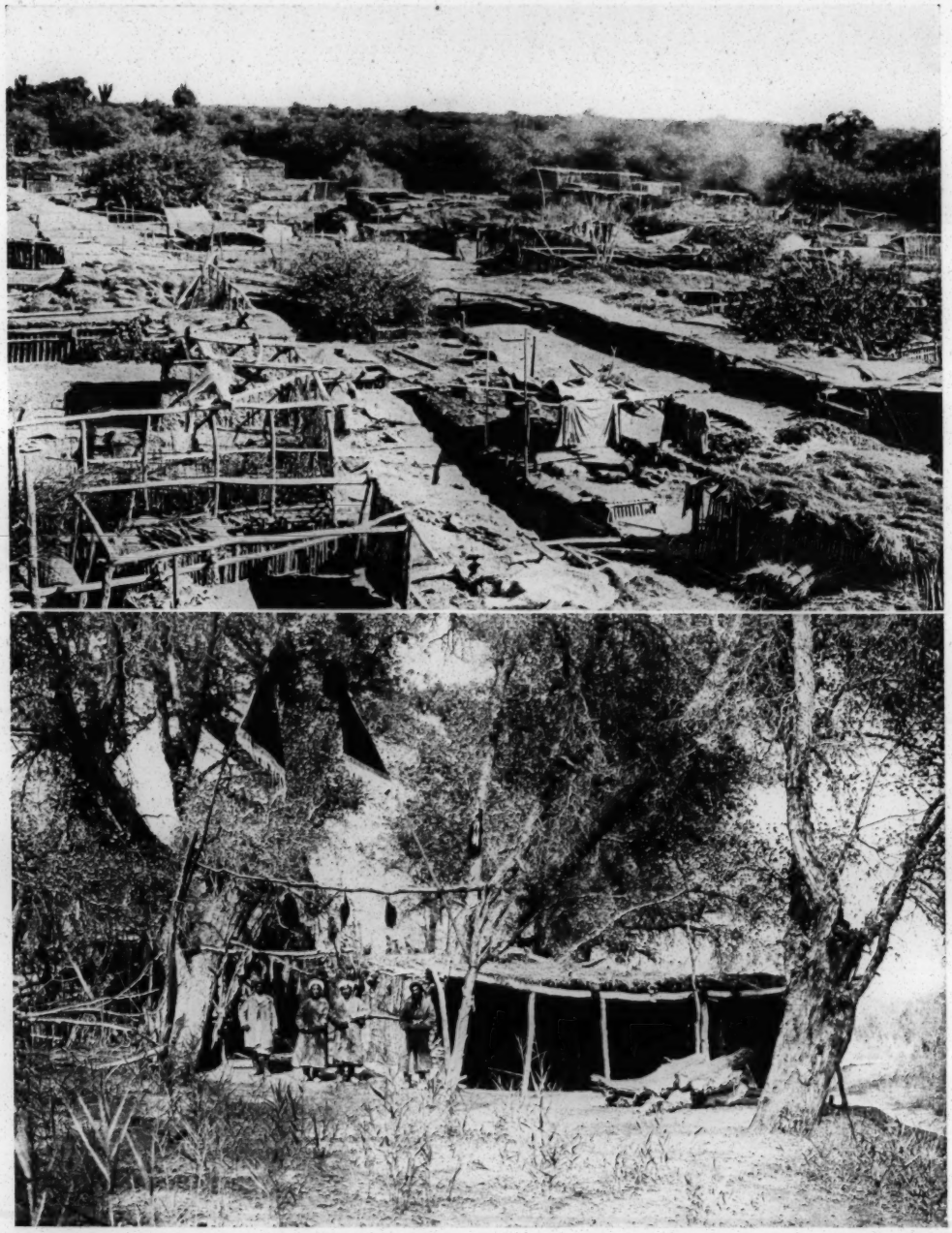
The old bed of Lop-Nor is one of the most absolute deserts in the world. In January, 1906, the writer explored this hitherto unknown waste, where even the hardy natives never venture. For five days the caravan stumbled wearily over a sea of rock-salt broken into huge polygons 10 or 12 feet in diameter, which had buckled up around the edges to a height of from one to three feet. It was like the choppiest sort of sea frozen solid. When we selected what appeared to be soft places in which to pitch the tents, the iron tent pegs bent double. When we wanted to spread our beds to sleep, it was necessary to hew away junks of salt with an axe. For 60 miles north and south and for nearly



Photos by Ellsworth Huntington

CHANTOS OF THE OASIS OF KHOTAN GATHERED FOR THE WEEKLY SUMMER FETE IN HONOR OF THE LIFE-GIVING RIVER

The woman in the foreground (right) suffers from goitre, a common malady, said to be due to malicious genii who grip people by the throat while they are sleeping



Photos by Ellsworth Huntington

THE OASIS OF KHOTAN

Entrance to the Shrine of Imam Jafir Sadik in the southern part of the Takla-makan Desert. A hundred yards from this gate one enters sand like that of the upper photograph on page 288. The Shrine is near the end of the Niya River.

200 east and west there is absolutely not a sign of any living thing.

It is relatively but a little while since Lop-Nor was much larger than now and expanded to such a size that most, if not all, of the old bed was covered by water, as is proved by the location of ancient roads and beaches. At the time of Christ, as the writer has shown in "The Pulse of Asia," the lake appears to have been of large dimensions. Then it diminished in size, and about five centuries later was probably as small or smaller than it now is. Later it expanded, and with varying fluctuations remained comparatively large until about 1600 A. D. Now it has once more diminished, and the people who formerly were supported by it have largely died off. A century or two ago they used to carry fish two or three hundred miles eastward to the Chinese cities where Nestorian Christians lived in the days of Marco Polo and earlier. Now the desert has become so rigorous and the fish have so decreased in number that the traffic has been given up. The writer of the Letters of Prester John was almost right when he said that fish were procured from the Sea of Sand. They certainly came from the border between it and the Sea of Salt.

Further details might be added showing that the statements in the Letters could only have been written by a man who had some knowledge of Central Asia, although his information may have been much distorted. Enough has been said to show that in Chaucer's day and earlier the Lop Basin was by no means an entirely unknown land. It is a continual surprise to mankind to find how wide a knowledge was possessed by earlier generations.

* For further information on this part of the world, the reader is referred to "The Pulse of Asia:" a journey in Central Asia, illustrating the geographic basis of history. By Ellsworth Huntington. Pp. 415. Illustrated. New York: Houghton, Mifflin & Co. 1907. $3.50.

THE KEY TO THE PACIFIC

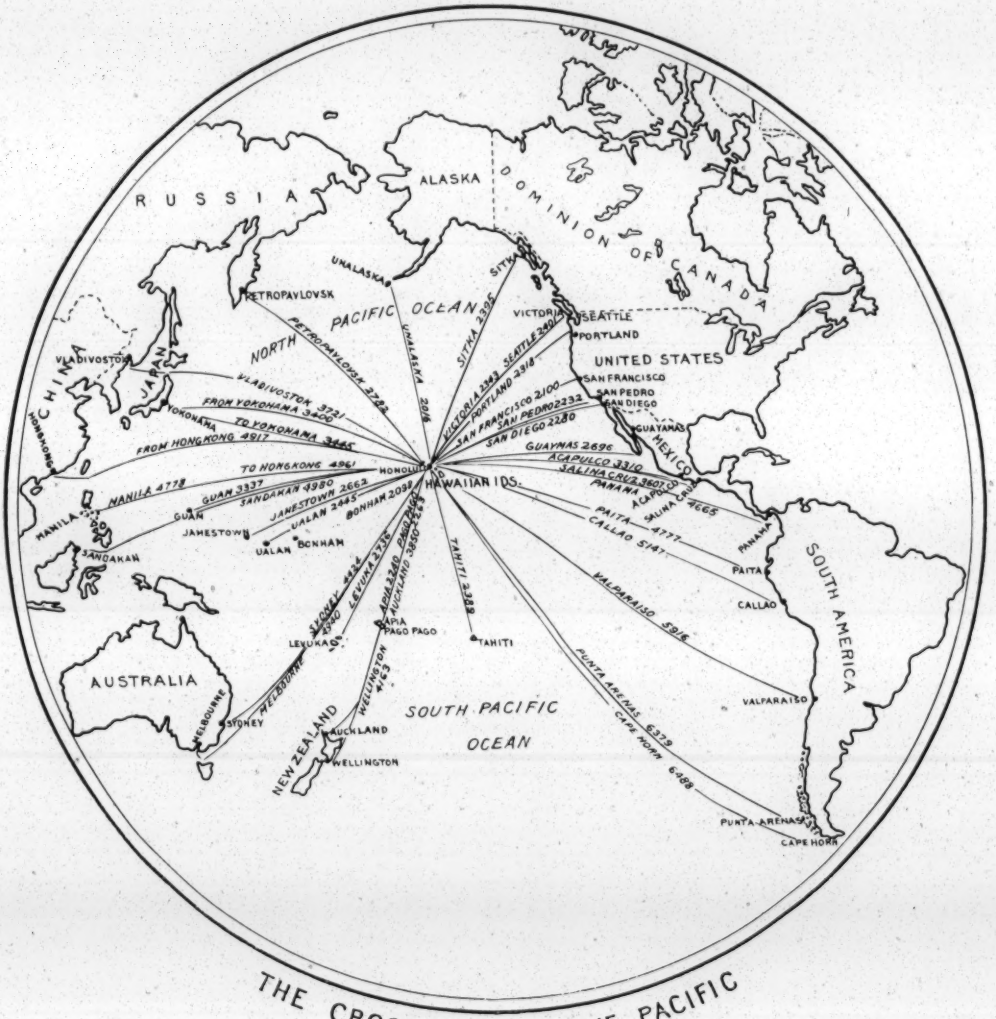
By Hon. George C. Perkins

United States Senator from California

THE importance of the Hawaiian Islands to the Pacific Coast states is supreme. Those states in the future will rely more and more for their prosperity upon the trade with the Orient across the Pacific, and with the East and Europe through the Panama Canal. That there may be a guarantee that this commerce shall endure and increase in volume, the United States must be at least the equal in naval power of any nation using those waters for the transportation of goods; and a part of the power of a navy is supplied by its bases, from which all exposed points can be best watched and whence aid can be most quickly sent.

As such a base the Hawaiian Islands present advantages to us which have no counterparts elsewhere in the Pacific. Lying within easy steaming distance of our Pacific coast, as naval vessels are today constructed, they afford a point from which the whole North Pacific Ocean can be patrolled by cruisers, and from which the commerce of the Panama Canal can be protected. They afford a strategic point whose vast significance can be realized best by supposing the islands in the hands of a hostile power engaged in war with us. From that point the enemy could send out cruisers to sweep from the sea the commerce of the Pacific ports and of the canal, while it would afford a base of operations for attacks on our Pacific Coast ports, as well as on the Canal Zone.

With these islands in the hands of an



THE CROSSROADS OF THE PACIFIC

enemy, it is doubtful whether we could control the canal for a day, while the entire coast line of the Pacific states and the bays and harbors of our rapidly growing Alaska would be in constant expectation of a hostile descent. For the defense of our Pacific coast and its commerce, therefore, the Hawaiian Islands are vital, and this fact is recognized, I think, by every one who has given the matter careful attention.

In addition to the strategic relation to the Pacific coast of the United States, which Hawaii possesses, it has a similar relation to our island possessions further west—Guam and the Philippines. Hawaii and Guam are the ocean stations of the American cable between the United States and our possessions on the coast of Asia, and as such are of vast importance in any scheme of defense of the Philippines or of the Pacific states. This line is of the greatest use to our commerce, and its safety can be assured only through means of defending its island stations against hostile attack.

XUM

And that commerce, which will continue to grow as the years pass, is not alone with progressive Japan and teeming China, but with our own fertile islands on the Asiatic coast and with the great English-speaking colonies of Great Britain in New Zealand and Australia. In 1893 our greatest authority on the sea power and naval strategy, Captain A. T. Mahan, wrote with reference to the proposed annexation of Hawaii:

"To any one viewing a map that shows the full extent of the Pacific . . . two circumstances will be strikingly and immediately apparent. He will see at a glance that the Sandwich Islands stand by themselves in a state of comparative isolation, amid a vast expanse of sea; and, again, that they form the center of a large circle whose radius is approximately the distance from Honolulu to San Francisco . . . this is substantially the same distance as from Honolulu to the Gilbert, Marshall, Samoan, and Society Islands, all under European control except Samoa, in which we have a part influence.

"To have a central position such as this, and to be alone, having no rival . . . are conditions that at once fix the attention of the strategist . . . But to this striking combination is to be added the remarkable relations borne . . . to the great commercial routes traversing this vast expanse.

"Too much stress cannot be laid upon the immense disadvantages to us of any maritime enemy having a coaling station well within 2,500 miles, as this is, of every point of our coast line from Puget Sound to Mexico. Were there many others available we might find it difficult to exclude them all. There is, however, but the one. Shut out from the Sandwich Islands as a coal base, an enemy is thrown back for supplies of fuel to distances of 3,500 or 4,000 miles—or between 7,000 and 8,000 going and coming—an impediment to sustained maritime operations well nigh prohibitive . . . It is rarely that so important a factor in the attack or defense of a coast line—of a sea frontier—is concentrated in a single position, and the circumstance renders doubly imperative upon us to secure it if we righteously can."

Hawaii is on the track of probably all the trade which the Pacific Coast states have with the rest of the world, and therefore, as a strategic point, it is of supreme importance that it be joined to us "by hooks of steel" which it would take the navies of the world to break.

The relation of a strategic point like Hawaii to the safety of the nation is illustrated by the relation of Gibraltar and Malta to the safety of Great Britain. The control of the Mediterranean is essential to England, as thereby she dominates the coasts of all the adjacent countries and controls hostile movements. "If," writes Lord Brassey, "we are resolved to retain our hold on the Mediterranean, it is imperatively necessary that our two naval bases at Malta and Gibraltar should be made secure from attack and efficient for the repair and protection of the fleet. In Malta and Gibraltar we hold strategical positions of the utmost importance." They are of utmost importance because they control the trade route through the Suez Canal, dominate the coasts of what may at some time be hostile nations, and render unnecessary the constant presence in the Mediterranean of a fleet of overwhelming strength. That strength may be safely confided to the channel and home fleets, which, with bases in that sea, can at any time secure control of it.

"If we abandon the Mediterranean," says Lord Brassey, "we cease to be a first-class power in Europe. . . . Upon a consideration of all the circumstances, it is clear that the dignity, the wealth, and the influence of England for peace depend on the retention of a paramount position as a naval power in the Mediterranean. We have that position now, and the recent manifestations of popular sentiment have shown that we are resolved to keep it." In that last sentence substitute for the words "England" and "Mediterranean" the words "United States" and "Pacific" and see if it will not apply with peculiar aptness to

our own position on the greatest of the world's oceans. I think it expresses the present situation with exactness, and is an unanswerable argument in behalf of securing to the United States the Hawaiian Islands as Great Britain has secured to herself Gibraltar and Malta.

These islands would not long remain ours, in case of war with a sea power, if they remain in the condition in which they now are. Gibraltar and Malta are the strongest fortresses in Europe. So should Hawaii be the strongest fortress in the Pacific. The President recognizes this, and in his latest annual address recommends an appropriation for the fortification of Pearl Harbor. The War Department also recognizes it, and recommends the appropriation of $1,100,000 with which to continue the necessary work. That this work should go on without intermission until we have established there an impregnable naval base goes without saying. The only thing needed is money, and I am sure that Congress sees the necessity of voting liberal appropriations.

Pearl Harbor is susceptible of being made another Gibraltar, where the largest fleet may safely lie and where repairs may be made at leisure. It consists of an elliptical lagoon 8 miles long by 4 wide, with a depth of water ranging from 30 to 130 feet. It is completely land-locked, preventing surprise attack from submarines or torpedo boats, as well as from hostile fleets. In the rear are mountain ranges 3,000 or 4,000 feet high, on the slopes of which are the military reservation, about 10 miles from the harbor, where a salubrious climate is secured. Reservations for fortifications, wharves, and all that is necessary for a first-class naval station have been secured, and this channel has been dredged to 30 feet, and may easily be deepened much more and straightened to insure easier navigation for battleships, which work can be done, it is thought, at an expense not exceeding $750,000, the value of the customs receipts of Honolulu for six months.

General Schofield, in 1872, reported on Pearl Harbor that "it could be completely defended by inexpensive batteries on either or both shores, firing across a narrow channel of entrance. Its waters are deep enough for the largest vessel of war, and its lochs, particularly around Rabbit Island, are spacious enough for a large number of vessels to ride at anchor in perfect security against all storms. Its shores are suitable for building proper establishments for sheltering the necessary supplies for a naval establishment, such as magazines of ammunition, provisions, coal, spars, rigging, etc., while the Island of Oahu, upon which it is situated, could furnish fresh provisions, meats, fruits, and vegetables in large quantities."

Too much stress cannot be given to the fact that if Pearl Harbor is to be fortified successfully the work must be done in time of peace. When war comes it would be too late, and woe to us if we are not prepared for defense as well as for attack. It behooves Congress, therefore, to give special attention now to the necessities of Pearl Harbor, and to liberally provide the means by which it may stand forever the strongest bulwark which we possess in the western ocean.

HAWAII FOR HOMES

By H. P. Wood

MUCH has been written about the charming climate of Hawaii, the beautiful scenery, and the smooth seas to the coral-fringed Paradise; and now that a struggle for the mastery of the Pacific, that ocean of such great potentialities, is on among the nations of the earth, it is seen that Hawaii,

from its strategic position, must soon become a great military stronghold, probably the greatest in the world. Certain it is that Pearl Harbor, on the Island of Oahu, near the city of Honolulu, will be rapidly developed as America's mid-Pacific naval base, the entire island of Oahu being practically converted into a vast military encampment. The protection of the Pacific coast and our prestige as a nation demand that this be done.

Hawaii's future prosperity, however, is not dependent upon its unequaled climate, beautiful scenery, or strategic position, but will be due to the fact that here is found, as possibly nowhere else on the face of the globe, all that goes to make perfect home conditions—a place where a man with a few acres of land can earn a good living for himself and family and provide for a comfortable old age, surrounded by all that tends to make life enjoyable.

Of Hawaii it has been well said: "A section able to produce such a variety of tropical articles as may be produced in the Hawaiian Islands, and having free hospitality of its citizens by those who have been privileged to voyage over access to a market demanding such enormous quantities of those various articles as does the market of the United States, ought to become not merely prosperous, as it already is, but one of the most prosperous and perhaps the most prosperous of all the tropical communities of the world. With the power to produce sugar, of which the United States imports more than one hundred million dollars' worth a year; with the power to produce coffee, of which we import from seventy-five to one hundred million dollars' worth annually; with the power to grow rubber, of which we import fifty million dollars' worth annually; with the power to produce tropical fruits, of which we import thirty-five million dollars' worth annually; with the power to produce sisal, of which we import fifteen million dollars' worth annually, and with the power to produce cocoa, of which we import nearly ten million dollars' worth annually, the possibilities of increased prosperity in Hawaii seem very great."

Today the advantages offered by Hawaii are enjoyed by comparatively few people—about 200,000, including the alien labor on the different plantations, or say 32 persons to the square mile for the entire area of 6,400 square miles. Switzerland, a bleak, inhospitable country as compared with Hawaii, sustains in comfort a population of 3,356,000. The same number to the square mile would give the territory of Hawaii a population of 1,344,000, a number equal to that supported by the broad plains and fertile acres of the State of Arkansas; or if populated as Italy, Hawaii would have 1,870,000 people within its boundaries, while Belgium's rate of population to the square mile would give Hawaii 3,760,000, or 19 times the present population.

Hawaii offers room and opportunities for many hundred thousands of home-seekers. The agricultural colleges throughout the country could perform splendid work in tropical agriculture, entering into correspondence with the dean of the College of Agriculture, Honolulu, Hawaii, and thus secure reliable data as to the wonderful growth of the pineapple industry and the possibilities in rubber, tobacco, tropical fruits, etc. By doing this they would confer a lasting benefit upon thousands of young men throughout the country who are now looking around for openings and who will find in Hawaii just the opportunities they are seeking.

The territorial authorities are most desirous of settling the islands with a citizen class of small landed proprietors, and will gladly welcome all home-builders who are strong and industrious, able and willing to work. It is the hope of those having the best interests of Hawaii at heart to make of the islands an ideal American community.

WHY NIK-KO IS BEAUTIFUL

By J. H. De Forest, Sendai, Japan

JAPAN is confessedly the most beautiful country in the world. Everywhere you go you have in sight the two essentials of bewitching scenery, mountains of every size and shape indented by picturesque canyons and lovely valleys, all based on water in bays and inlets and ocean. It is a land of perpetual beauty, conspicuously central to which is the peerless Fuji, the only mountain on the globe that rises 12,365 feet in one impressive unbroken curve from the ocean.

But hidden among all this scenic grandeur the one great park of wooded mountains around a crater lake that with foreigners and natives alike takes the prize is the Nik-kō region. *Kek-kō* is the Japanese word for superlatively splendid, so that all through Japan these two words are inseparably mated—Nik-kō and Kek-kō. Don't say Kek-kō until you've seen Nik-kō. You have no sufficient knowledge of the splendid until you have visited this park of splendor. If you try to analyze Nik-kō's splendor, one captivating feature is the avenue of mighty cryptomerias that for a dozen miles forms a lofty Gothic archway leading up to the village 2,000 feet above the ocean. Another important element is the waterfalls and cascades that burst from the sides of the wooded mountains or tumble in amazing confusion over precipitous rocks into the dark, narrow valleys. Yet one more element is the exceptionally large crater lake, Chūzenji, 4,385 feet up in the clouds, surrounded by the old crater walls, portions of which are now gently sloping and covered with dense forests, while on another section rises the dead peak of the last volcano that helps to make Nik-kō and its vicinity so wonderfully beautiful—Nantai-zan.

But nature's work has been richly supplemented by man's hand in beautifying this paradise. There is the red bridge of one span (80 feet), which is reserved exclusively for His Majesty the Emperor. When General Grant visited Nik-kō as the guest of the nation, this sacred bridge was opened for him, but he modestly declined to cross the Imperial bridge, thereby winning the deep reverence and affection of the people. Even the present Crown Prince a few years ago refused to cross the bridge, preferring to identify himself with the people by taking the common bridge just below.

Beyond the bridge, amid tall cryptomerias, is a historic Buddhist temple, whose sweeping double roof is in perfect harmony with its surroundings. You cannot but gaze at it whenever it appears in sight. A little farther on is the mausoleum of Ieyasu, the greatest statesman of feudal Japan, under whose orders the political Christianity of the Catholics was stamped out in fearful slaughters of believers and the country closed against foreign intercourse. High above the mausoleums of Ieyasu and his grandson Iemitsu, on a rocky formation, is Ieyasu's massive bronze tomb.

But apart from what man has done, what makes this region so enchantingly beautiful? What is the secret of this beauty? This was the question that continuously challenged me as I spent a few weeks in this environment. In general it may be said that Japan's beauty is of a different type from much of our European and American beauty. New England, for example, with its shores, its mountains, its innumerable lakes, all near sea-level, is indeed beautiful, but its rounded hills, its moraines, and lakelets are all the work of immense glaciers. Japan, however, is wholly the child of volcanoes and earthquakes. Hence the long curving slopes of many of the mountains; the abrupt and frightful contortions of portions of the mountain scenery; the marvelously entrancing crater lakes far up in the skies. Any one

THE MONSEKI OF RINNŌ TEMPLE, ABBOT HIKOSAKA

used to our glacial beauty is at first sight surprised and captivated by Japan's volcanic beauty.

Now Nik-kō seems to have gathered into its own region all the beauty possible under volcanic conditions. The long egg-shaped Lake Chūzenji was once the crater of a horrible volcano. It blew high in air from its huge mouth the froth of its lavas and buried deep the whole region around with its so-called ashes. Then its lavas rising in the crater broke through the weak tufa walls and flowed in red-hot streams over the coarse ashes in every possible direction, baking them into tough, porous rocks. Later on another prolonged blast of coarse ashes and rocks would bury the lavas scores of feet deep, only to be again overflowed by boiling streams of lava, until the whole

THE WIND GOD IN IEMITSU'S MAUSOLEUM

region became alternate strata of lava and tufa, broken here and there by earthquakes of tremendous power. And out of this frightful desolation and disorder has come the exceptional beauty of Nik-kō! Every waterfall there tumbles off from a lava bed, and wherever possible cuts down through the underlying tufa and flows along on the next lower lava shelf.

It adds tenfold to the enjoyment of seeing the finest waterfall in Japan, Kegon, if you only notice how it was made. It is one huge spout of water about 20 feet in diameter jumping about 250 feet into the pool below. From top to bottom it is white with foam, and, as it falls, from its edges shoot off comet-like bunches of water with spreading tails of thinner foam, until the whole has passed the lava cliff a hundred feet thick. When to the beauty of this magnificent column of water-foam is added the beauty of a fringe of baby waterfalls bursting from the underlying tufa, and half encircling the giant spout, they all together take the final plunge of a hundred feet more: and when the gorgeous foliage of the ravine bends across the gorge, so that against this spotless white foam you can see the shapes of the branches and leaves, you have a picture the memory of which abides forever with every lover of nature.

In descending the ravine to the place where Kegon looks its best, we pass close to one of the tufa strata, from the holes of which shoot out water enough to make a powerful, roaring stream, and this cascade in turn makes another famed waterfall called Haku-un, the White Cloud. The photograph plainly shows the thick lava above and the innumerable streams breaking out where the lava meets the tufa.

Coming down from Chūzenji to Nik-kō any one can see lavas and tufas alternating where the mountain sides have been denuded by storms or broken by earthquakes. I saw seven such strata in one place, and it was that sight which gave me the key to the beauty of Nik-kō. At one of the tea-houses on the road are seen two charming falls in the distant ravines tumbling off thin lava beds. They have cut through one tufa bed and are flowing along on the lava bed, from which they tumble down to another. The stream that flows through Nik-kō is con-

NEAR IEYASU'S MAUSOLEUM

On the way to Chuzenji is a graveyard so overshadowed with cryptomerias that it is hard to get good photos. This avenue is formed by the lofty monolithic gravestones of the illustrious Samurai, who had the Shogun's permission to commit *hara kiri* in order to accompany their beloved Ieyasu on his journey of death.

fined in narrow and winding lava channels just above the town, where the swollen waters boil with frightful noise. It is one of the sights of Nik-kō to watch the violent threshing of the water there upon the twisted sides and cavities of the unyielding lava. Just below this hell-gate, called Gamman-ga-fuchi, is the Imperial bridge, one of the charms of which to me is that its massive stone posts rest on the last appearance of the lava beds that flowed down from an unknown volcano of the distant past. Far up the hill to the left the tomb of Ieyasu stands on the highest part of this same ancient lava stratum.

The artificial beauty of Nik-kō centers around the Rinnō temple and the mausoleums of Ieyasu and Iemitsu. To meet the two men who hold the highest places in the sacred enclosures, and talk with them about the intensely interesting history of this region, is a real education. Being favored through our (then) legation with letters of introduction from the Home Minister, I was shown the national treasures of the Buddhist temple and of the Ieyasu mausoleum. This is no place to go into details, but I was so cordially met by these gentlemen that I wish to add to this partial description of Nik-kō the faces of these distinguished officials from photographs they kindly gave me. The position of high priest, or abbot, in Rinnō-ji is an Imperial appointment. The young princes and princesses who spend

THE VOLCANO ASAMA

Asama is a living volcano, 8,000 feet high, south of the Nik-kō region and a favorite tramping place for summer tourists. Over a hundred years ago the rising lavas broke through the weak tufa sides and flowed down a valley. These steam-filled lavas exploded into most frightful shapes and form one of the most desolate of views. Had the lavas of Nik-kō been torn into such beds of desolation there would be no such beauty as is there now.

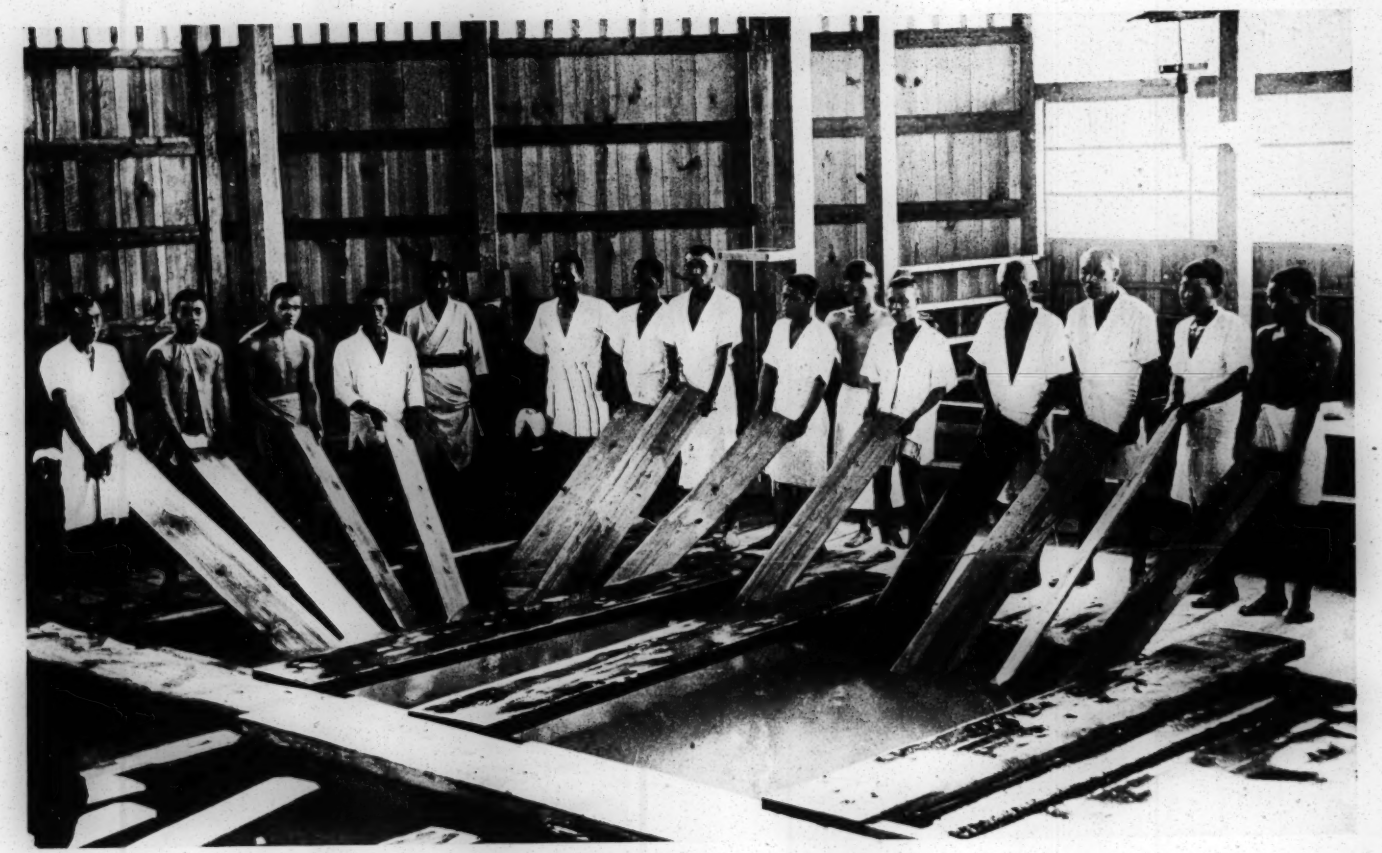
KUSATSU HOT SPRINGS, BETWEEN THE VOLCANOES ASAMA AND SHIRANE

The peak of Shirane appears in the distance, where a crater lake is being made. The exterior of the bath-house whose interior is shown in the next photos. Hundreds of people afflicted with syphilis and leprosy gather at this famous hot spring.

the summer at Nik-kō used to go every morning to the court of the temple and "worship" the souls of the officers who died in the Russian war. The alcove before which they knelt was filled with the photographs of these brave and loyal men. The distinguished title of the Abbot Hiko-saka is *Monseki*, which conveys the meaning of Imperial appointment. It was in this temple court that General and Mrs. Grant were entertained, and as in those early days (about 1878) there was no foreign hotel in Nik-kō, and therefore no such thing as a bedstead, the priest had a bedstead made worthy of a military hero. There is no scrimping of timber in its frame, and, since springs were wholly unknown, they wove the bedstead with bands of plate iron! A mate to this bedstead was made on the same heroic plan for Her Excellency Mrs. Grant. When this famous couple went to bed, of course they found over the iron network a pile of soft silk *futons* a foot thick.

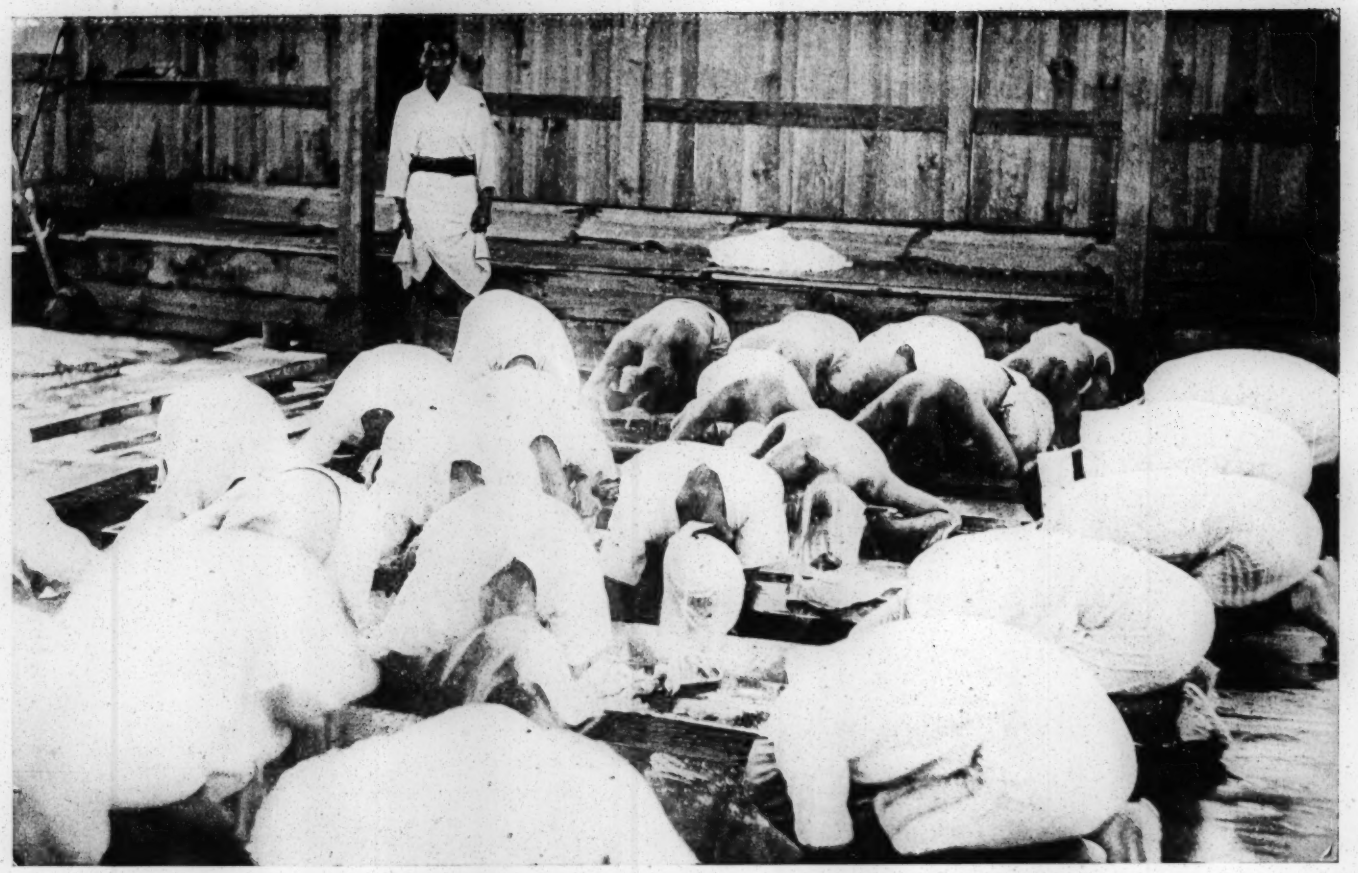
The official chief of the Shogun shrines is Baron Naka-yama, one of the highest in rank among Shintoists. It is well to remember that Shintoism is not now called a religion by the Japanese; it is a cult. No government has ever handled the perplexing question of church and state so admirably as has that of Japan. Seeing that Shintoism with the "worship" of the Imperial ancestors and national heroes would surely lead to a clash with Christianity, Shintoism was officially changed from the grade of a religion to that of a cult which concerns Japan alone. This step leaves it possible for a Christian to "worship" at the shrines just as we worship when we take off our hats at the tomb of Washington. In the course of a delightful conversation I asked the Baron, "Is there any objection to a Shintoist becoming a Christian?" He replied with a smile, "None whatever."

Nik-kō is a great national center of religion and reverence in an environment of marvelous beauty.



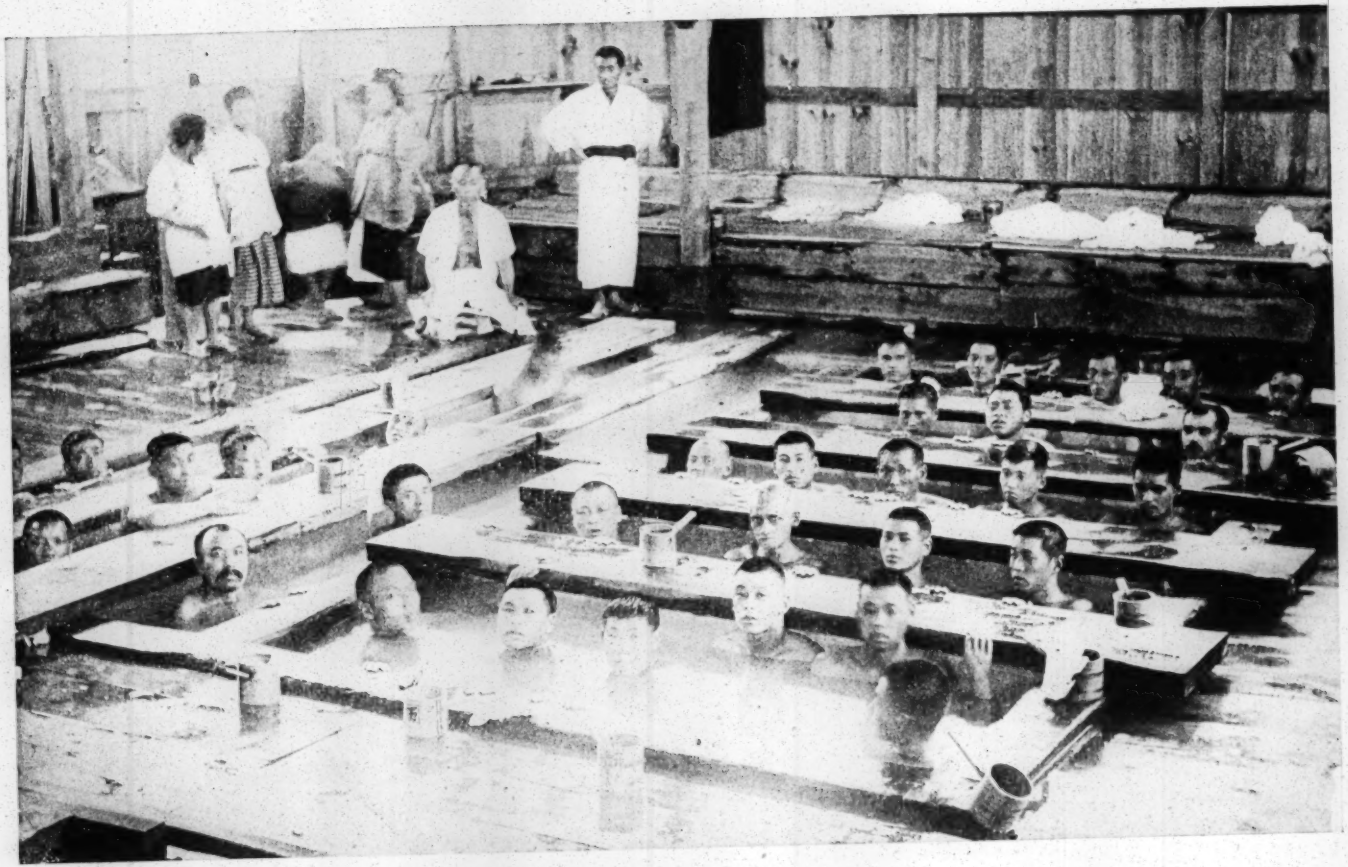
KUSATSU HOT SPRINGS, NO. 1. INSIDE THE BATH-HOUSE FOR MEN

The water is from 130° to 160°, and would scald any one. By splashing these boards, the water in an hour is reduced to 120° heat, when patients can safely enter, though even then they shrink from the almost intolerable heat. The water might be cooled by pouring in cold water, but this would spoil the medicinal qualities.



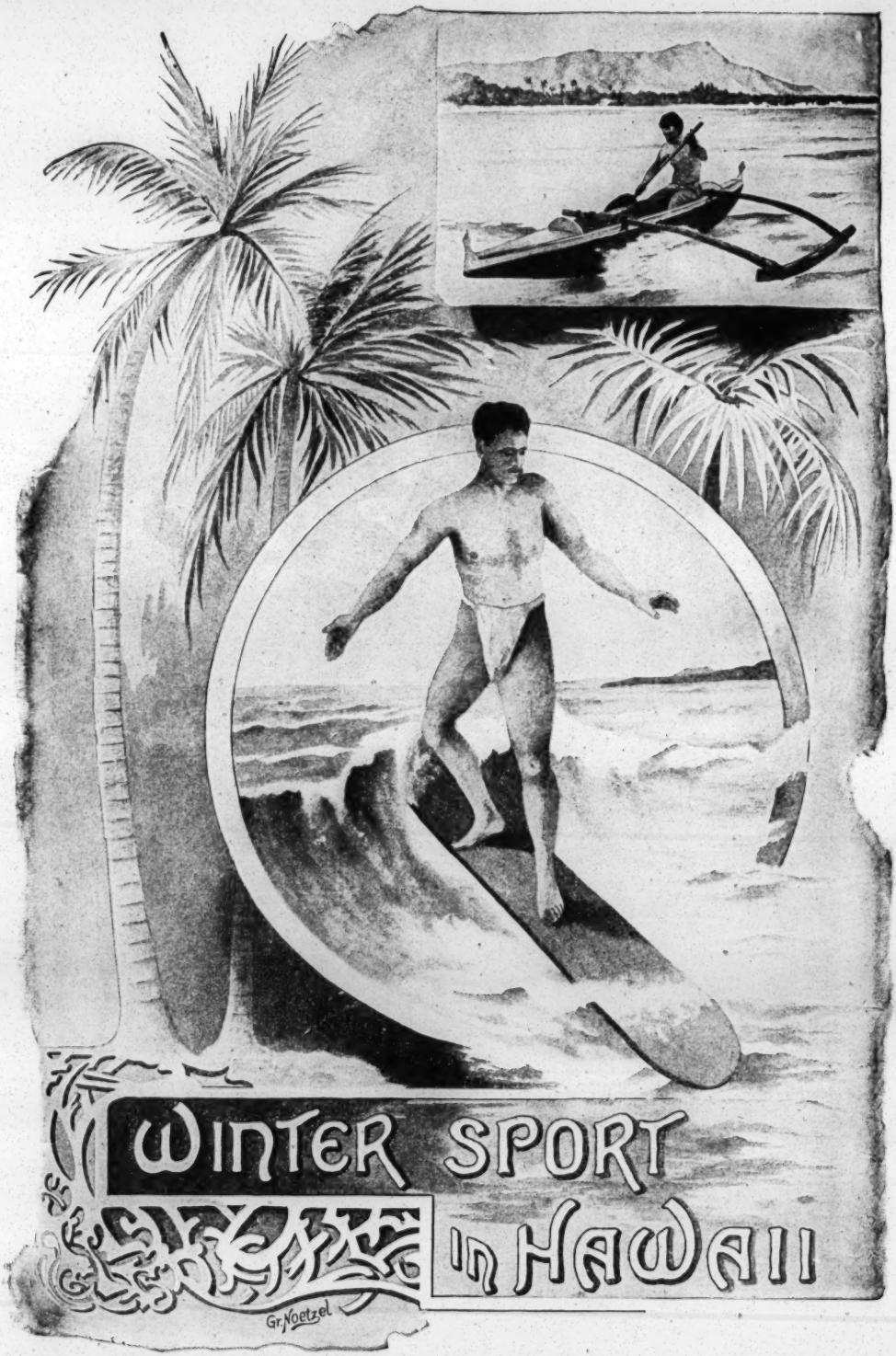
KUSATSU, NO. 2

The patients have to pour hot water over their heads 100 times before entering, in order to prevent bad effects. In this photo they are dressed for the sake of the picture. Generally there is no such display of propriety, but just the reverse



KUSATSU, NO. 3

They all get in together at the command of the bath-master and endure, as best they can, the semi-scalding for three or four minutes, and when the time is announced for exit, they get out much faster than they got in



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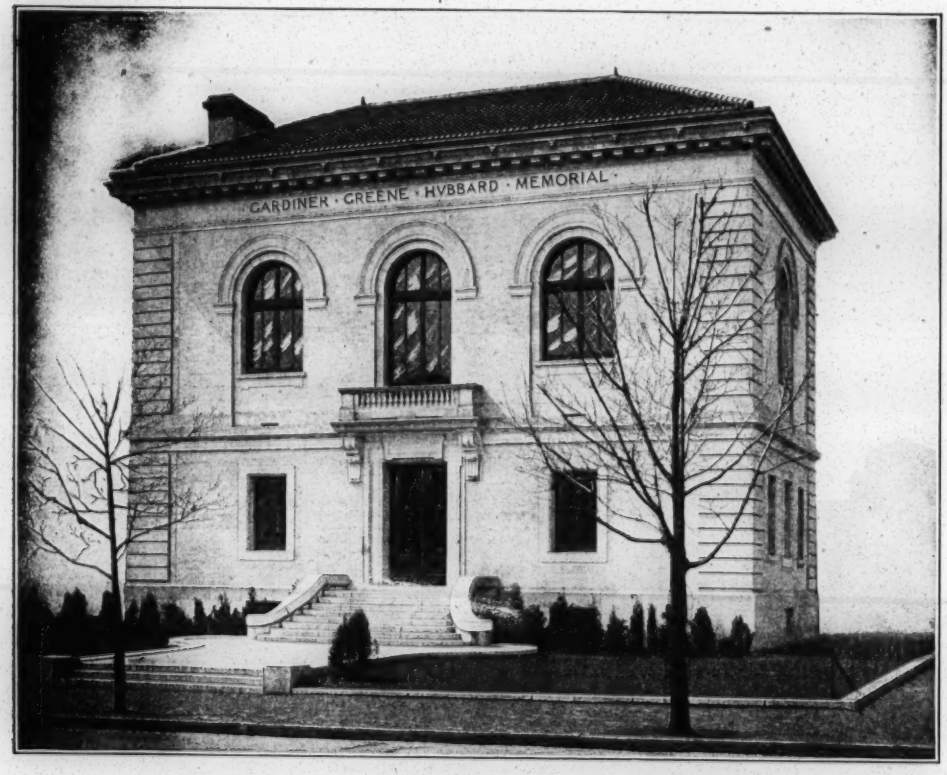

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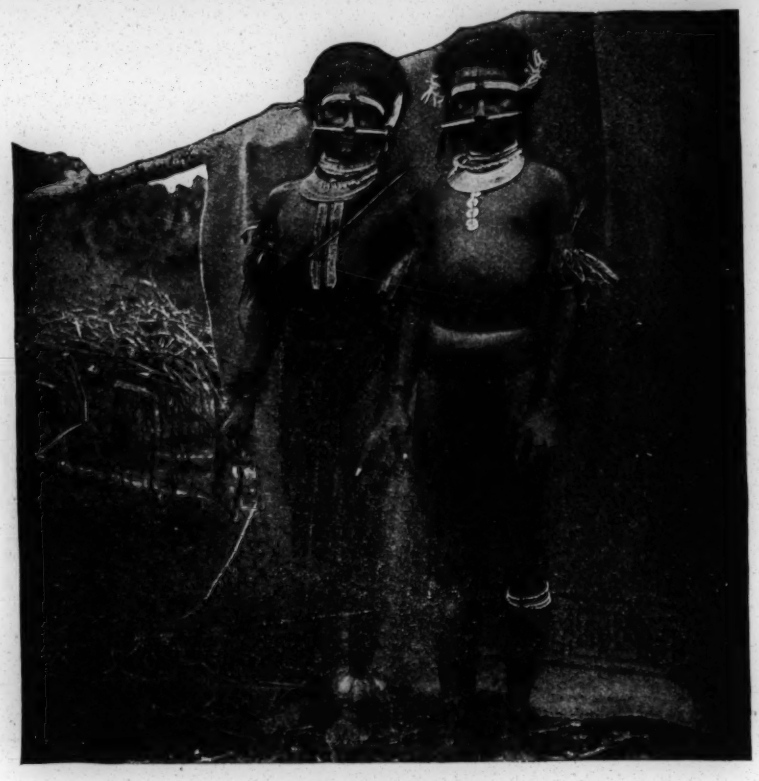

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